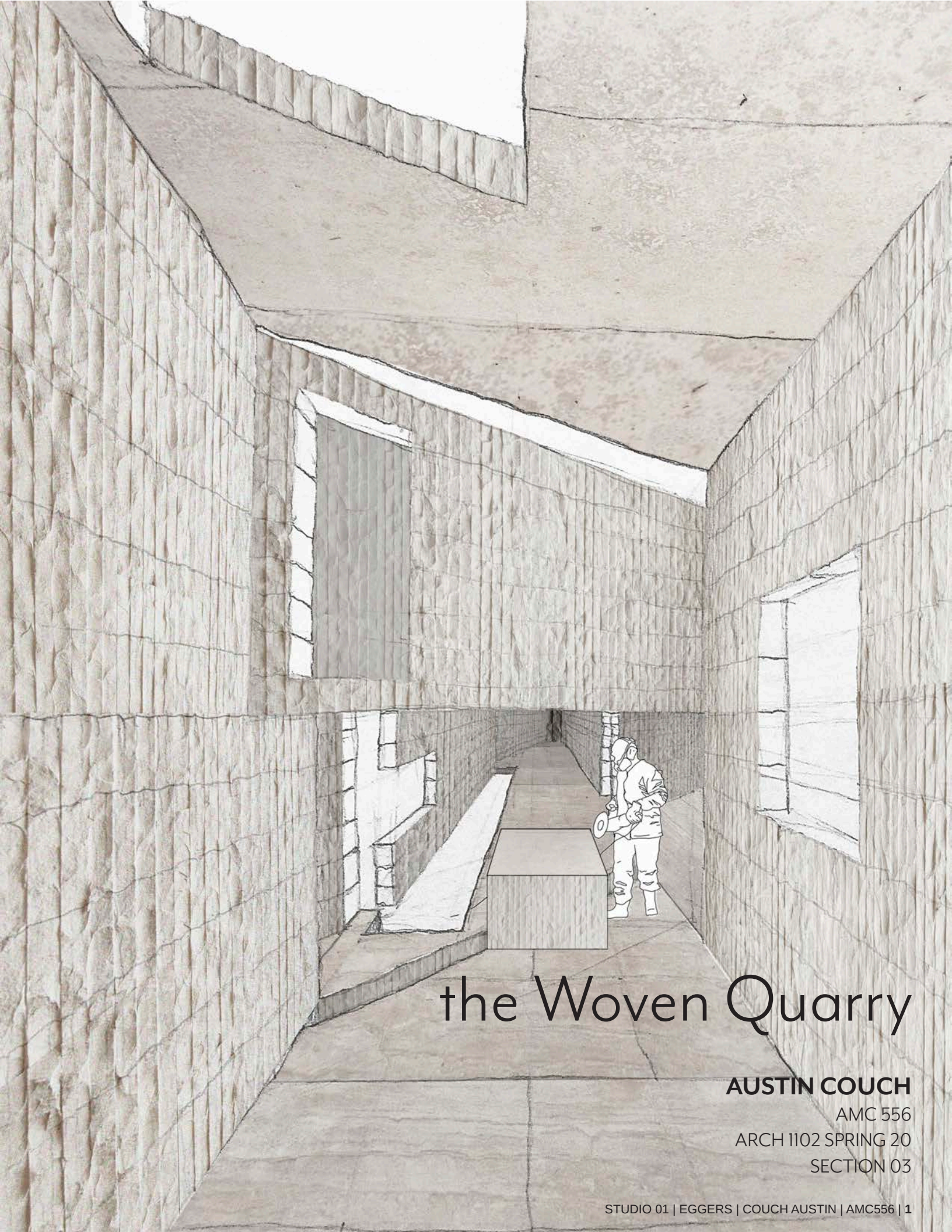


the Woven Quarry

AUSTIN COUCH
AMC 556
ARCH 1102 SPRING 20
SECTION 03

ASSIGNMENT A1

My assigned material this semester is sedimentary rock. I focused on lime-stone, a malleable, yet strong material. Limestone, like most stone is strong in compression and is the most common sedimentary stone in the world.

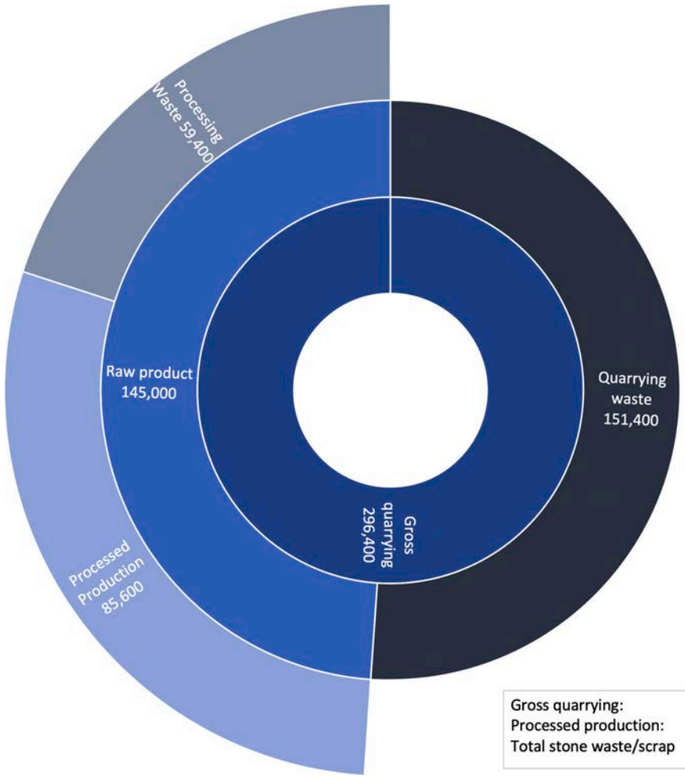
CHERT

SHALE

SANDSTONE

FORMATION AND VARIETY

Sedimentary rocks are formed on or near the earth's surface through geological process of erosion, weathering, dissolution, precipitation, and lithification. Sediments composed of geological detribus and organic detribus are transported to the deposition site by agents of denudation(such as water, wind, mass movement.) Fossil fuels and organic matter combining with the sediment lead to cementation.The grains composed of sedimentary rocks vary in sizes so that different kinds of sedimentary rocks have different textures. Aside from limestone, sedimentary rock comes in many forms such as sandstone, shale and chert. Differing between each type of stone are hardness, abundance, coloration, and many other properties.



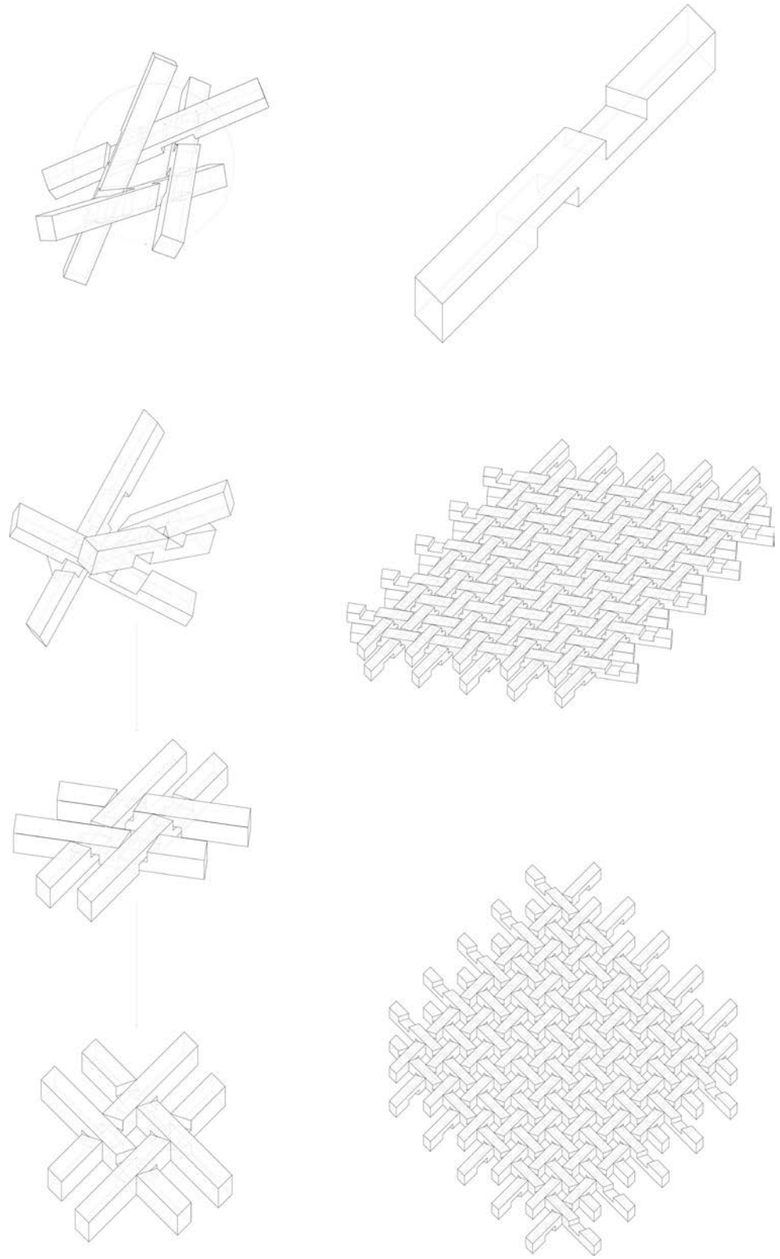
Gross quarrying:	296,400 kt (100 %)
Processed production:	85,600 kt (29 %)
Total stone waste/scrap	210,800 kt (71%)

STONE IN A CIRCULAR ECONOMY

In quarrying limstone, nearly 50% of all material is wasted, in addition to large quantitites of proccessing and energy waste. Most waste comes from large manufacturers, while local sources are often more efficent and less damaging to the environment. Stone quarrying is a purely subtractive and linear process, and it cannot be replenished easily because it takes millions of years for sediment to compress.

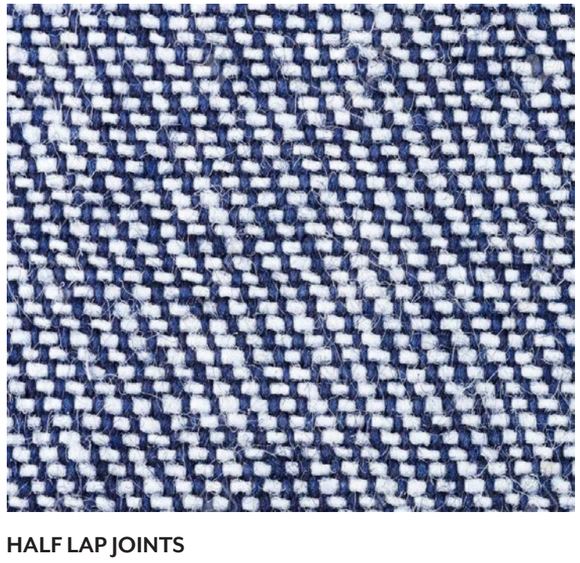
LIMESTONE QUARRYING AND MANUFACTURING

Limestone quarries can be cut in a multitude of ways, where vertical and horizontal terracing are the most common. Vertical terracing happens when vertical cuts are made into cliffs, then split along natural fracturing lines. Horizontal terracing happens when horizontal cuts are made along natural fracture lines and then split. Stones are sized down and refined through subtraction proccesses such as sawing, cutting, and chiseling.



ASSIGNMENT A2

The joint consists of alternated angled half-lap joints, which, when twisted together, weave in and out of one another to create a tensile structure. The limitations come at the bending capacity of materials, where most pieces made of stone could not stretch more than three or four joints.

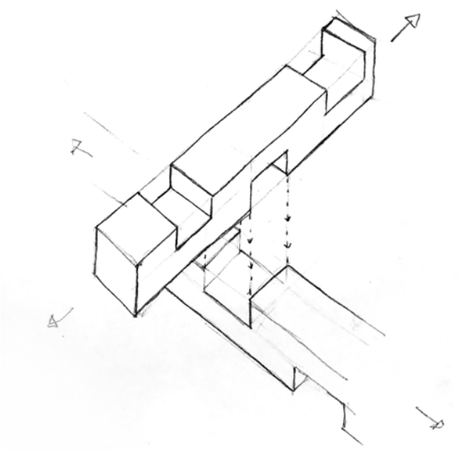


WARP AND WEFT

Textiles have a warp and a weft, referring to the different directions that the threads run. The warp and weft depend on each other structurally; without one, you cannot have the other. This tensile property gives it its strength and ability to stretch.

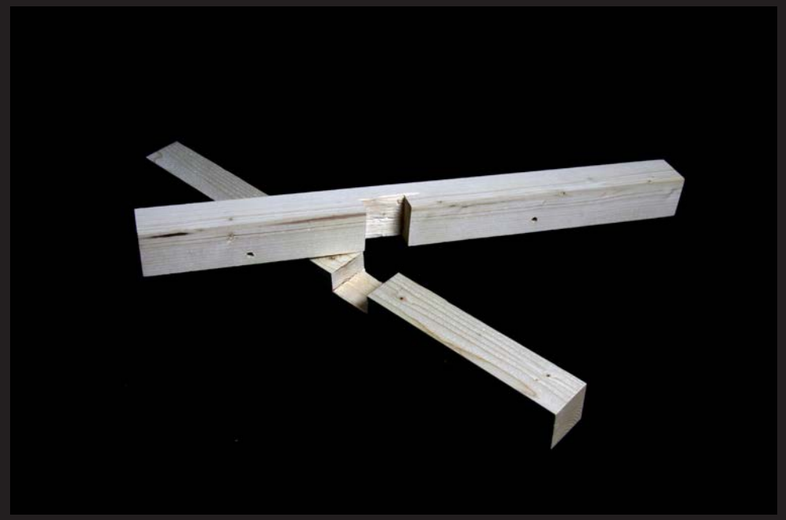
HALF LAP JOINTS

The system of alternated half lap joints, through cutting slots in the slots in the stone, wove together with other pieces, without having to bend or manipulate the material in ways that it is not meant to.

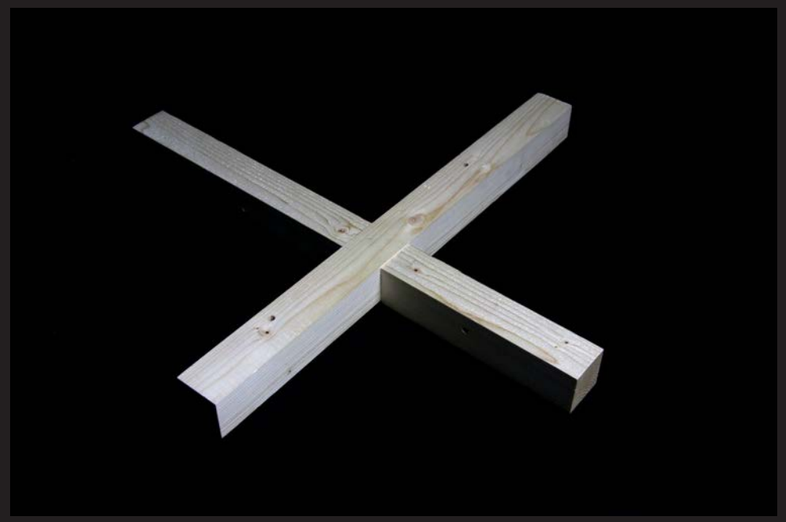


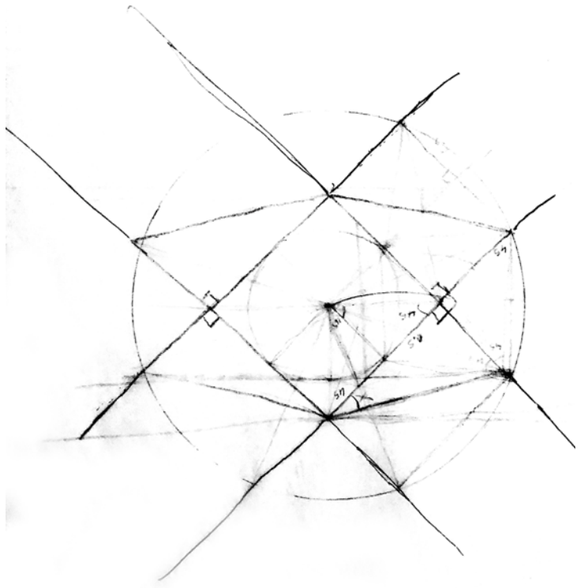
SINGLE WOOD PIECE

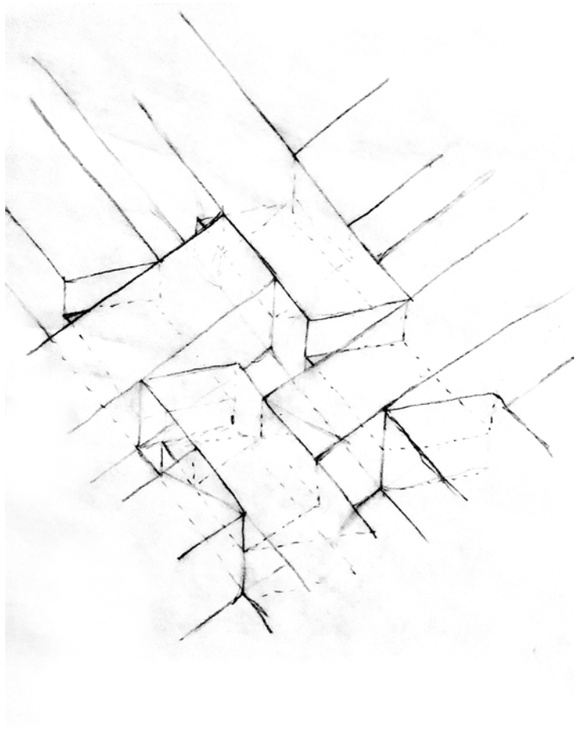
UNCONNECTED HALF LAP JOINT



CONNECTED HALF LAP JOINT

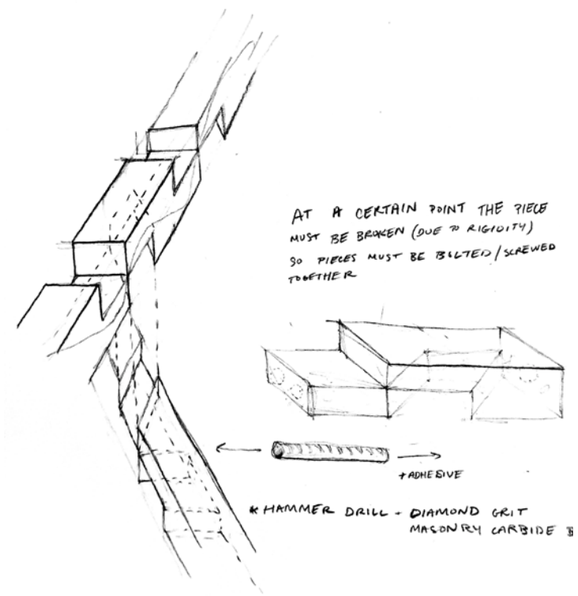




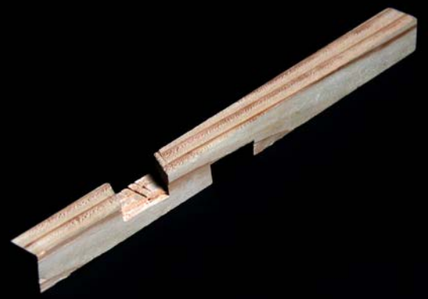


ANGLES

The joints changed from orthagonal to angled joints, thus allowing an a larger aggregation to be assembled. The angles also made the joints able to stretch, mimicking the tensile properties of textiles.



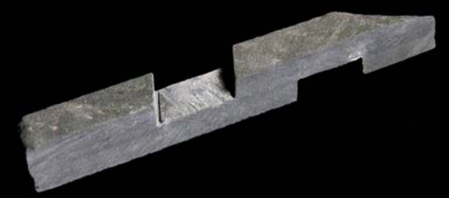
SINGLE WOOD
PIECE



ANGLED WOOD
JOINT

ORTHAGONAL
WOOD JOINT

SINGLE STONE
PIECE

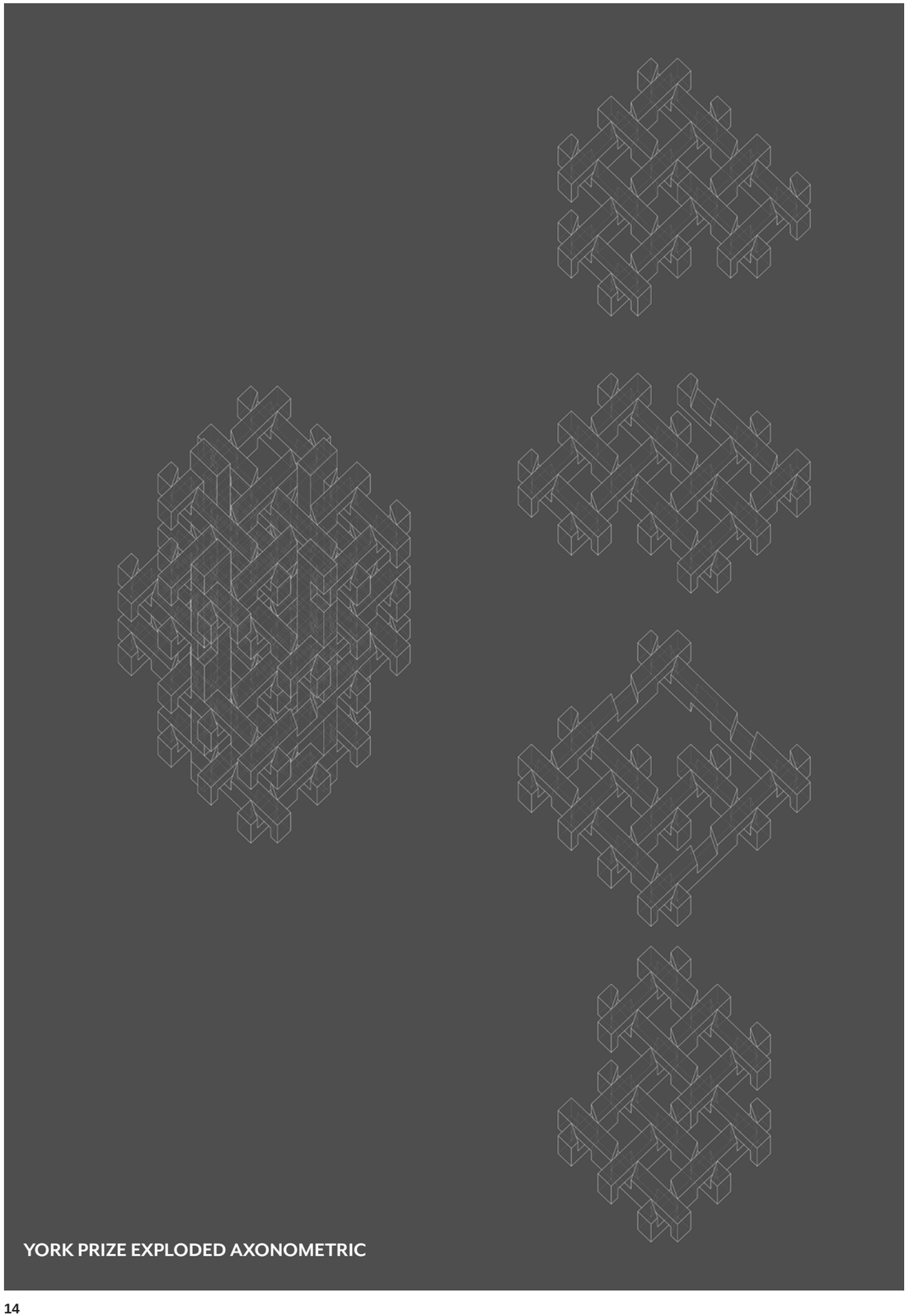


ANGLED STONE
JOINT

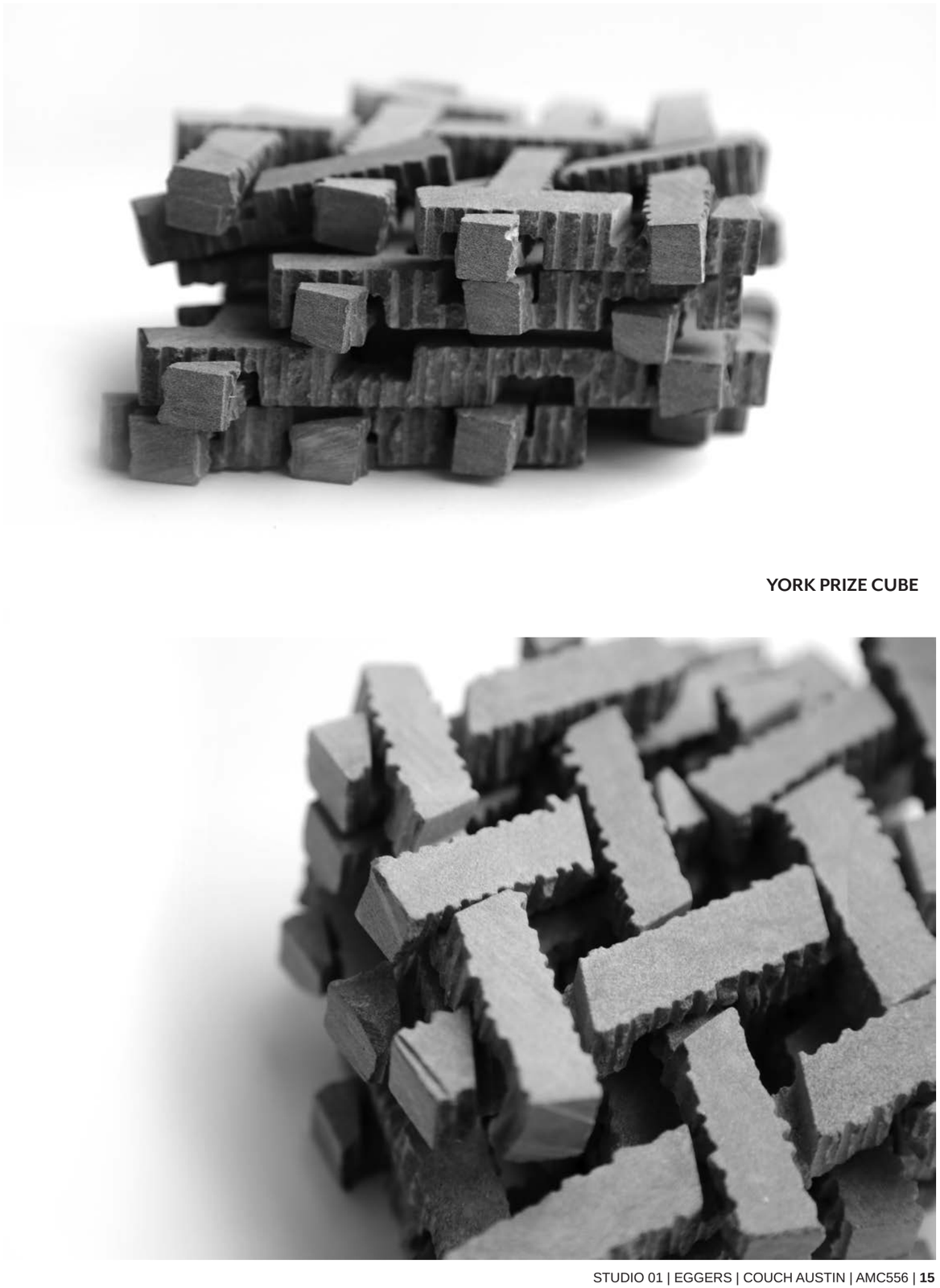
ORTHAGONAL
STONE JOINT

YORK PRIZE

My york prize model consists of the joint aggregated into random series that are stacked onto one another. Each limestone strips are cut vertically and chiseled to replicate vertical terracing processes.



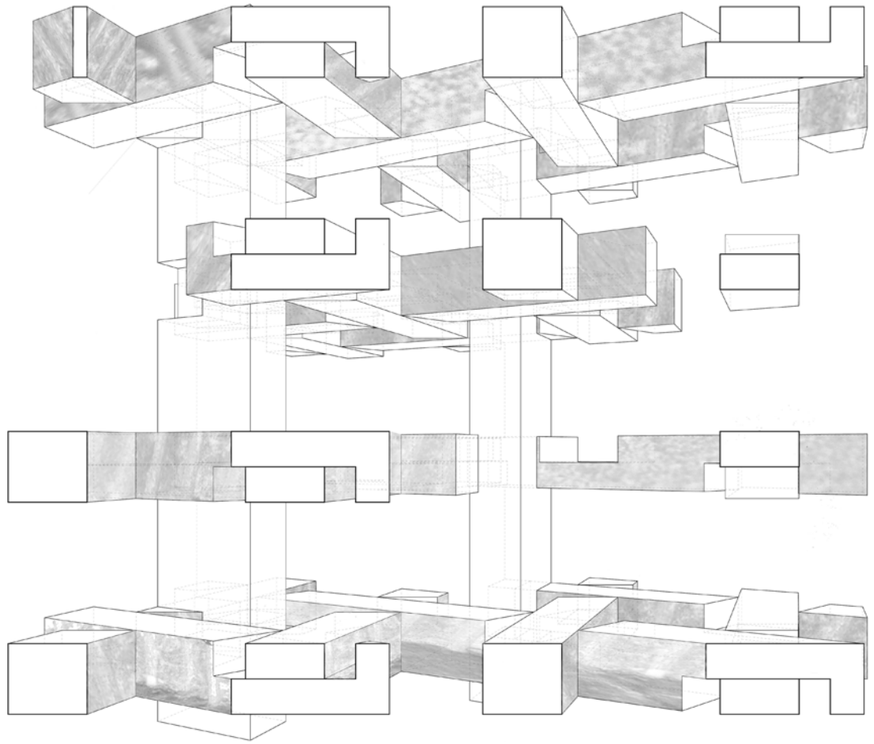
YORK PRIZE EXPLODED AXONOMETRIC



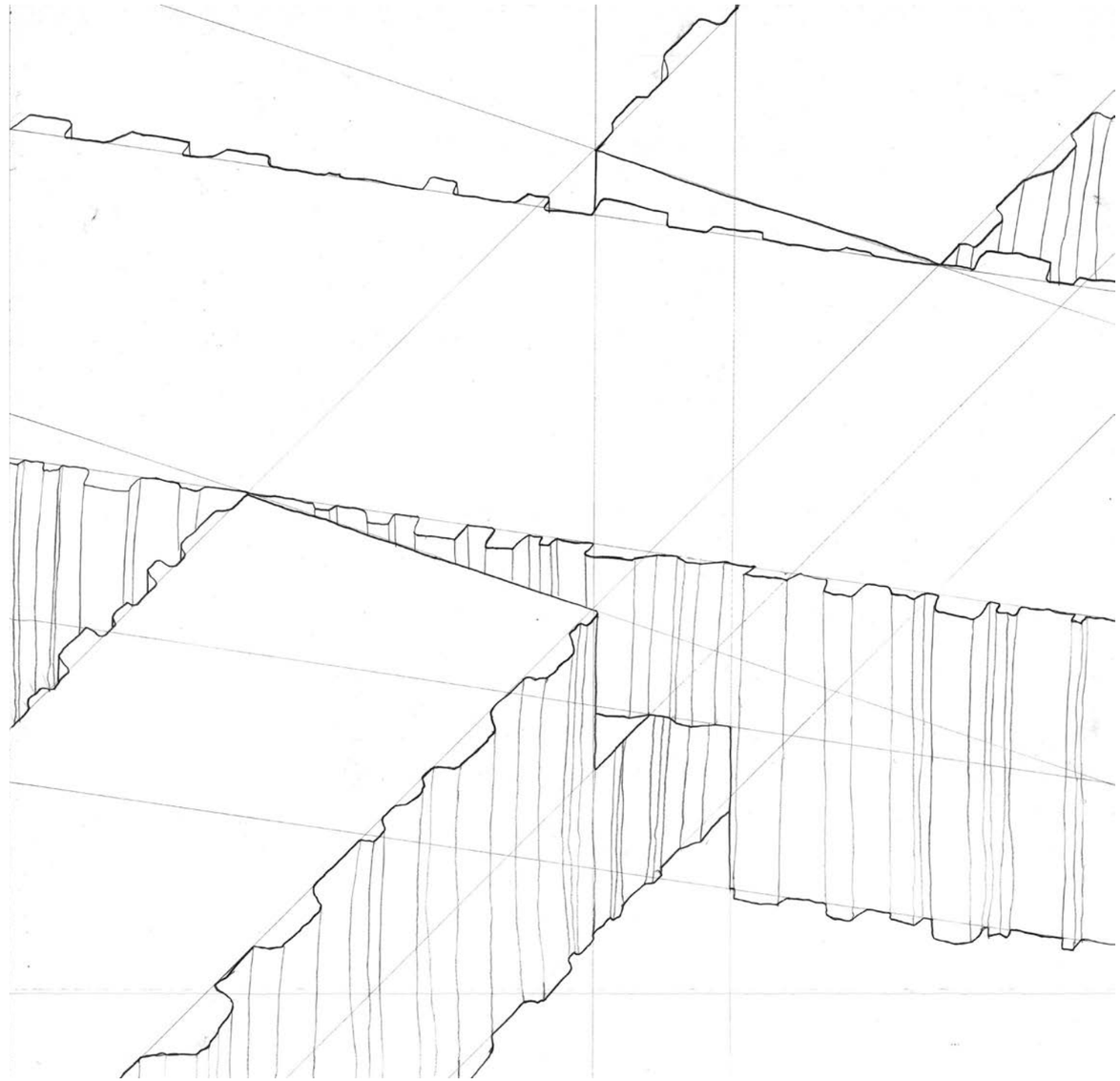
YORK PRIZE CUBE

ASSIGNMENT B1

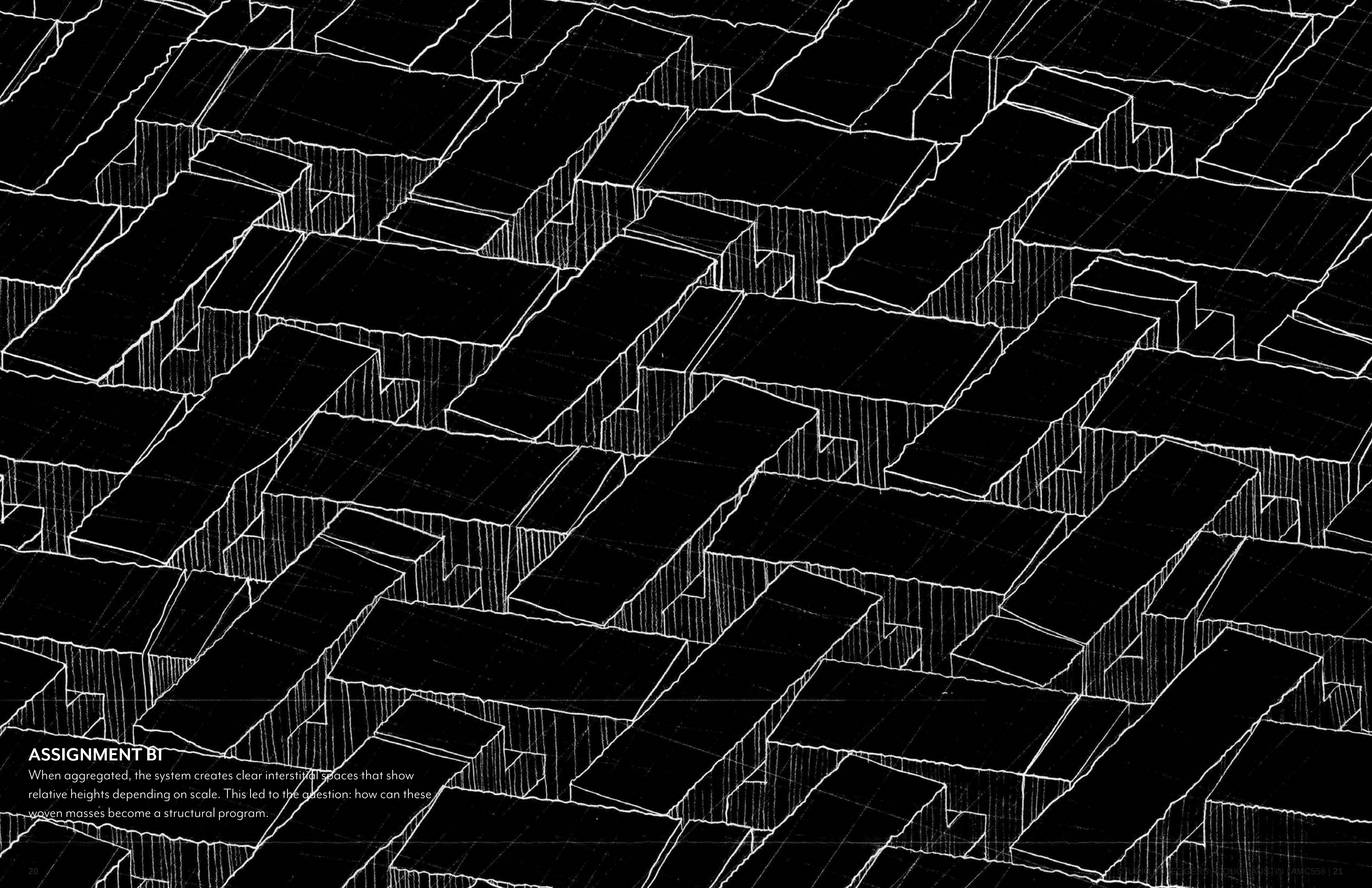
I understood the space of the york prize model to elicit unique imperfections specifically in between the connected pieces. These cracks are shown here creating occupiable zones in an atmospheric plane.



YORK PRIZE SECTION
When the york prize model is split in half zones begin to reveal themselves as being single or double height spaces, emphasizing a language of vertical weaving.



ZOOMED-IN JOINT
The imperfections of the stone create occupiable spaces in between the large massings.

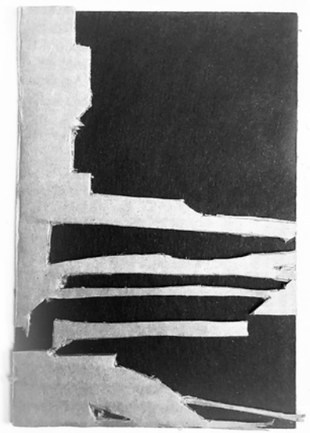


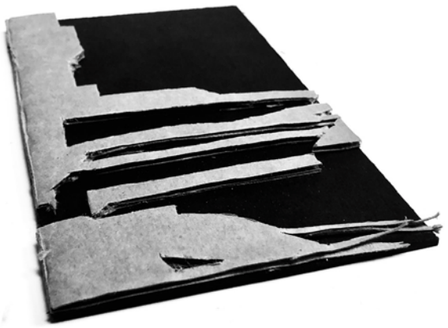
ASSIGNMENT B1

When aggregated, the system creates clear interstitial spaces that show relative heights depending on scale. This led to the question: how can these woven masses become a structural program.

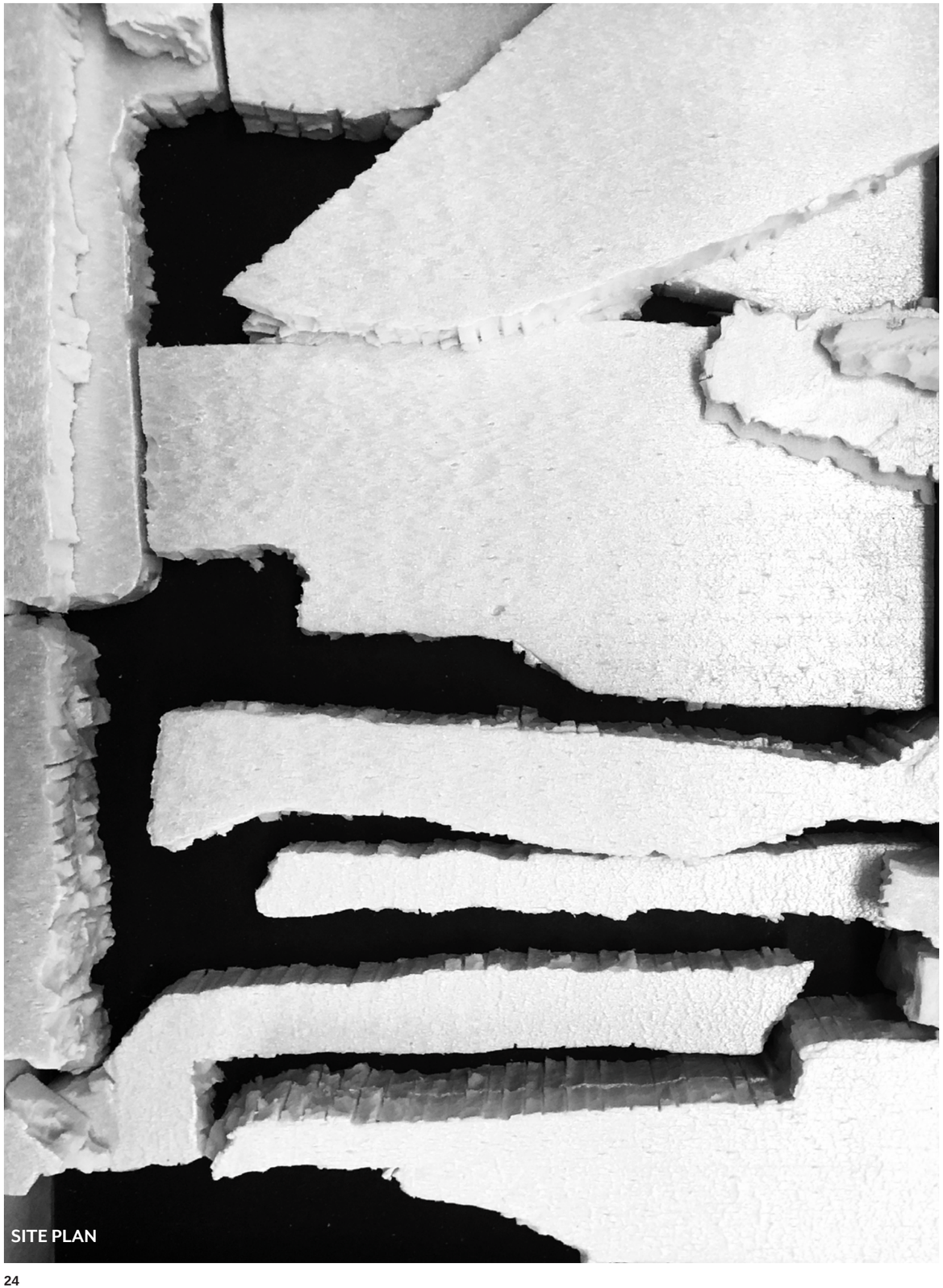
ASSIGNMENT C1

The site was interpreted as a series of extruded surfaces, where the bottom surface was filled with shallow water. This moved forward as an abandoned vertically terraced limestone quarry.





SKETCH MODELED SITES

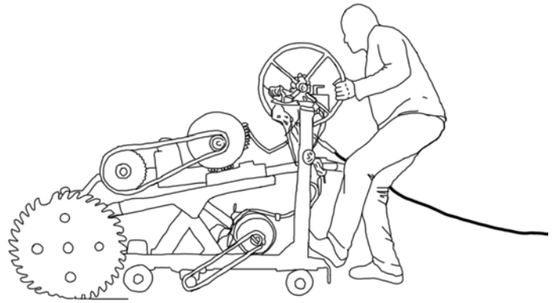


SITE PLAN

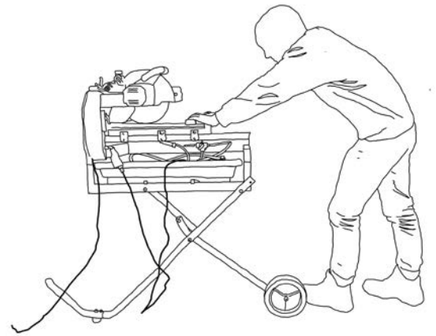
QUARRIED GORGES

Using the various strips identified in the site, quarried out gorges began to relate to in-between zones read in the B2 drawings.

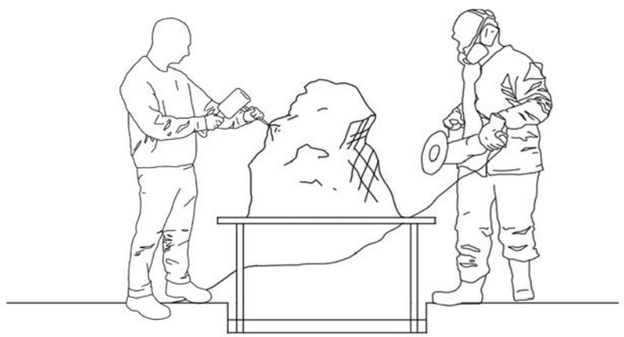
EXTRACTION
The artisan extracts stone blocks from the nearby quarry using a rotor blade.

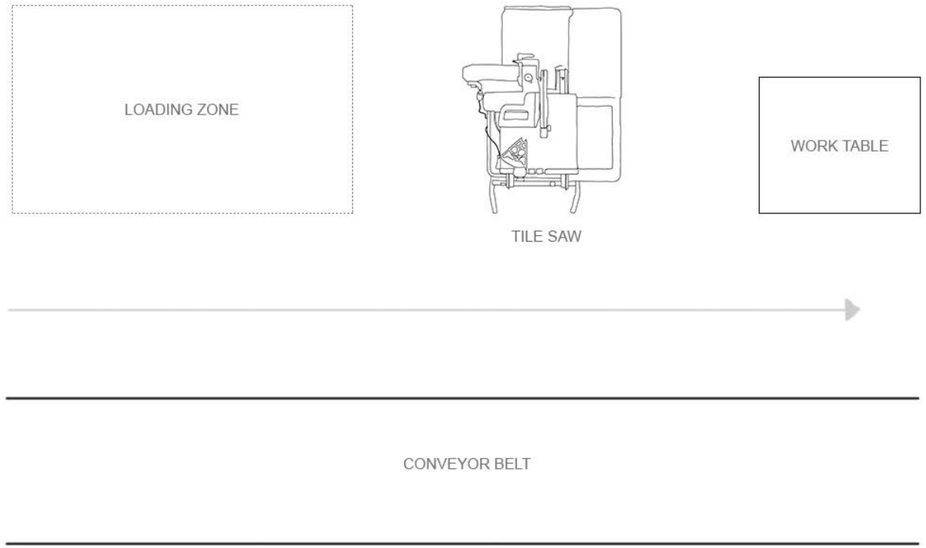


CUTTING
The artisan resizes the extracted blocks by cutting them using a tile saw.

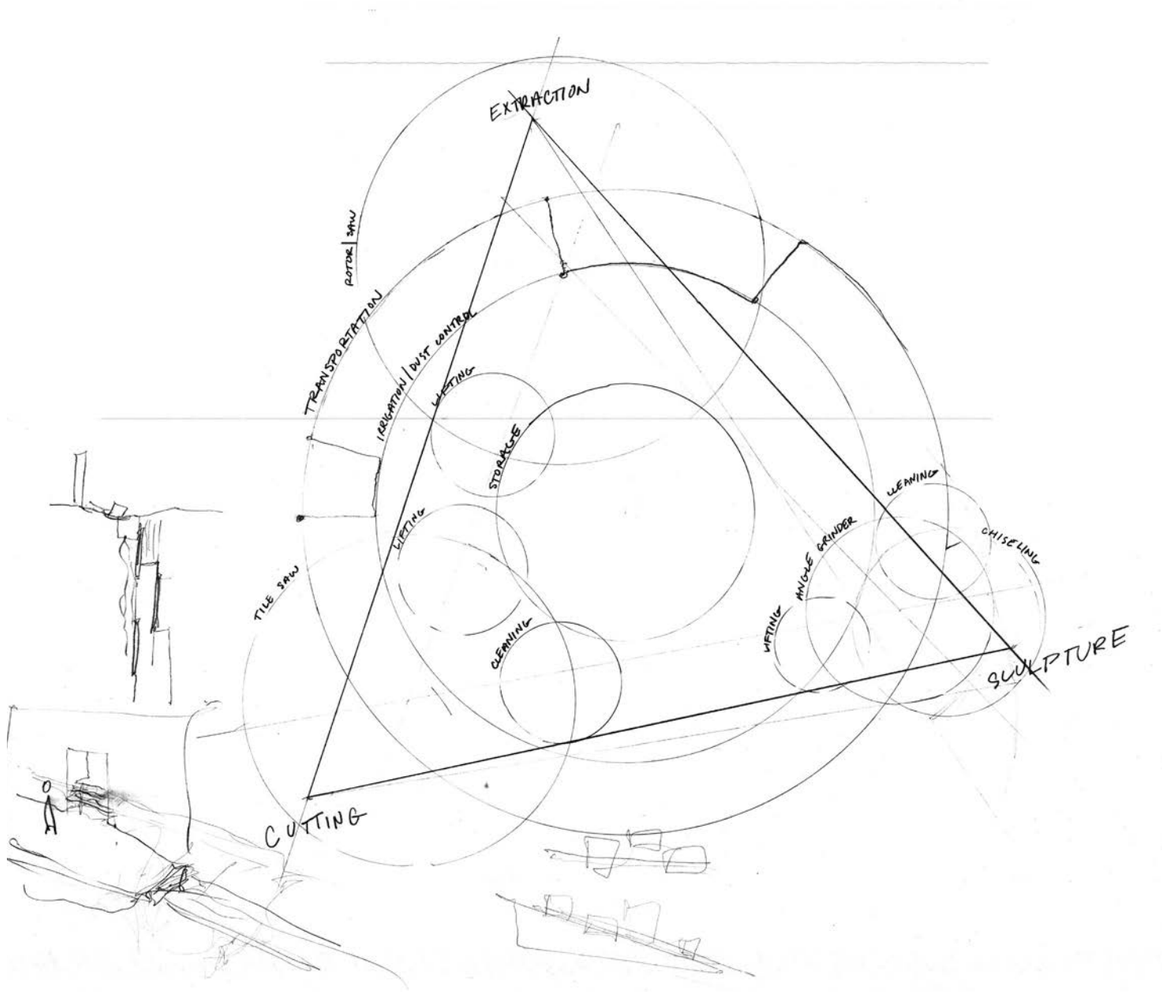


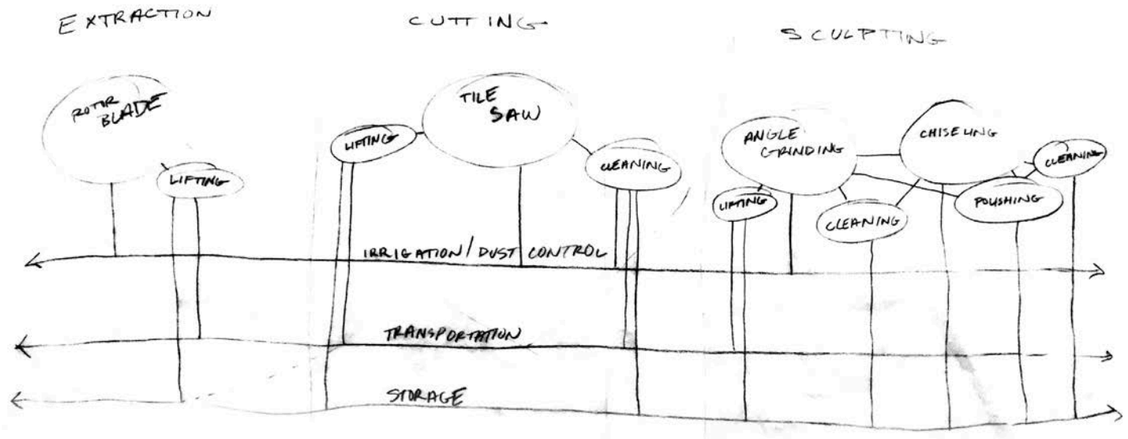
SCULPTING
The artisan starts to manipulate the material through sculpting with chisels and and angle grinders.

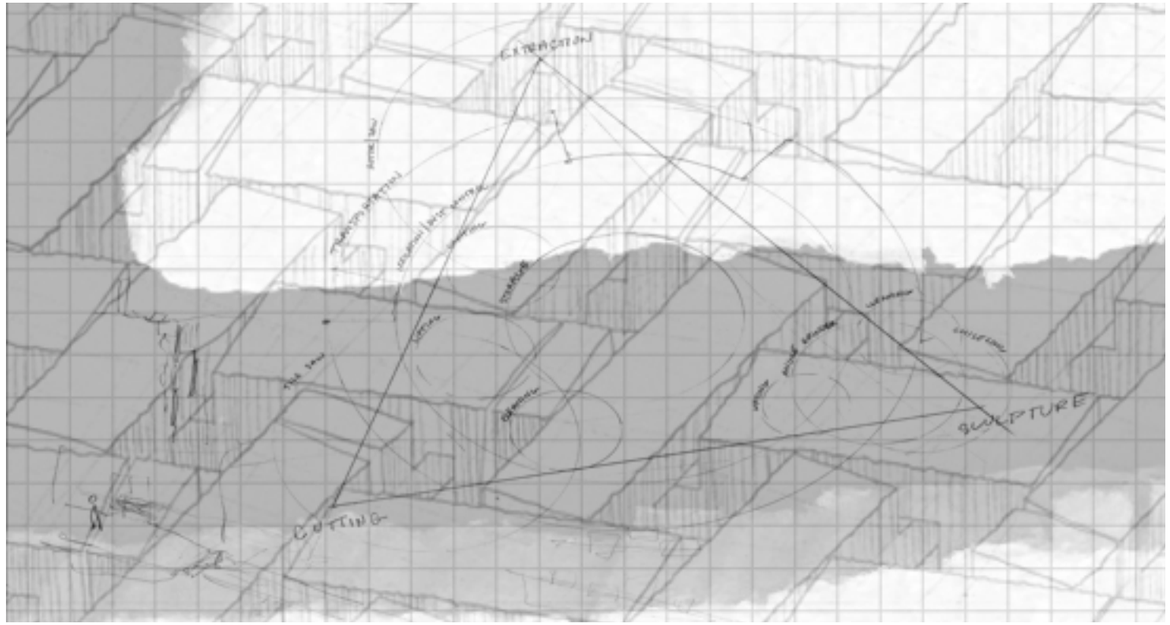




RELATIONAL SEQUENCE
The first iteration of the program focuses on the sequential processes in a liner fashion, where there is a clear direction of the matrial through the process of subtraction.



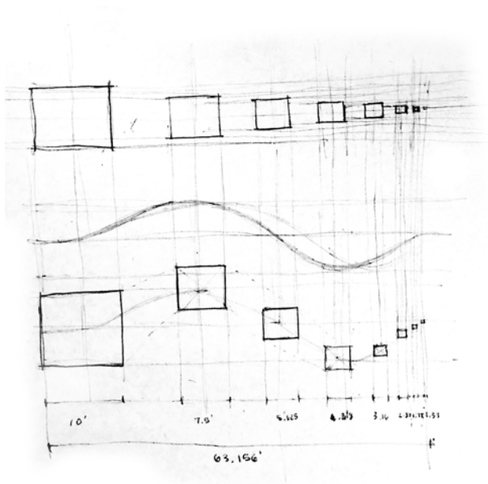


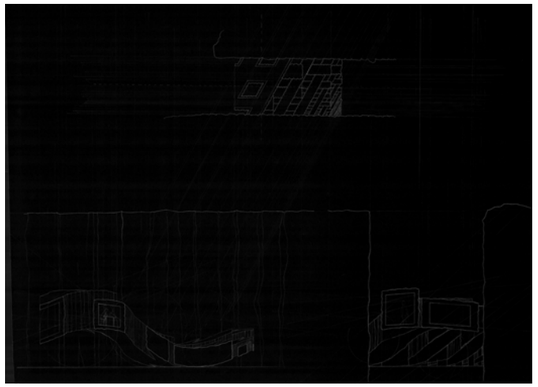


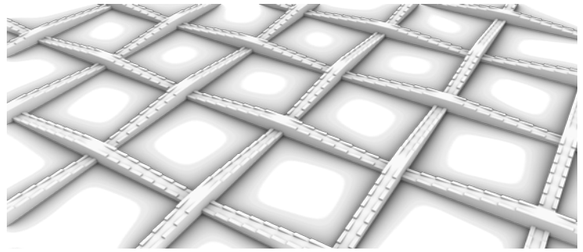
ASSIGNMENT C2

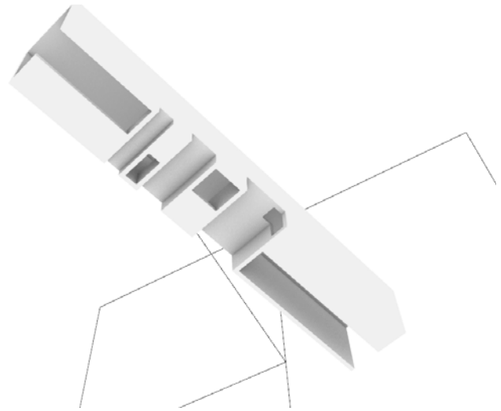
A systematic program developed with focus on the three proccesses in which the artisan partakes in (extracting, cutting, and sculpting). Relevant secendary and tertiary functions (transportation, irrigation, air control) became apparent thus, driving the form and location of the site.

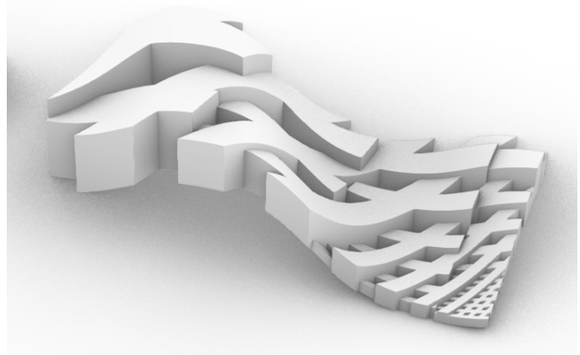
RELATIONAL SPACE DIAGRAMS

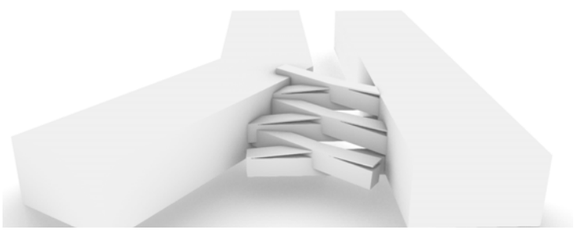


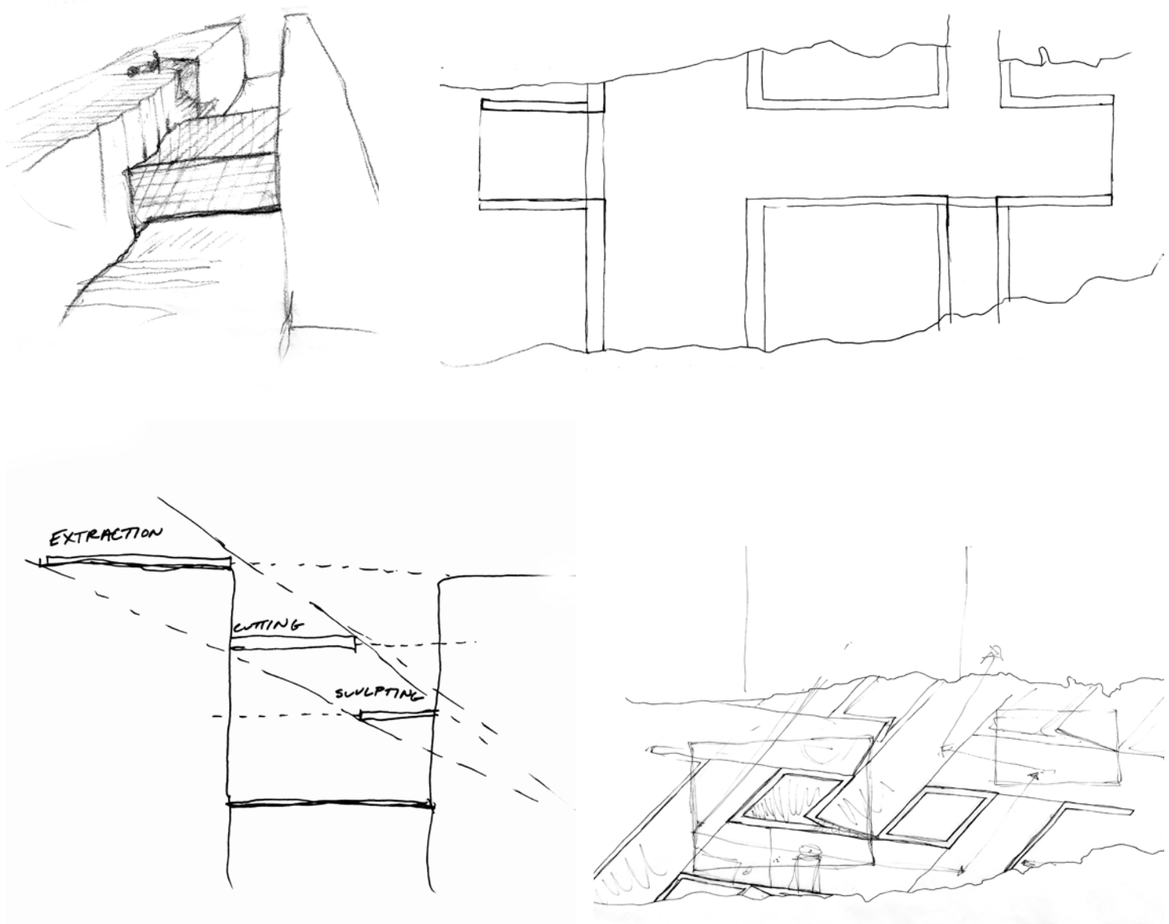






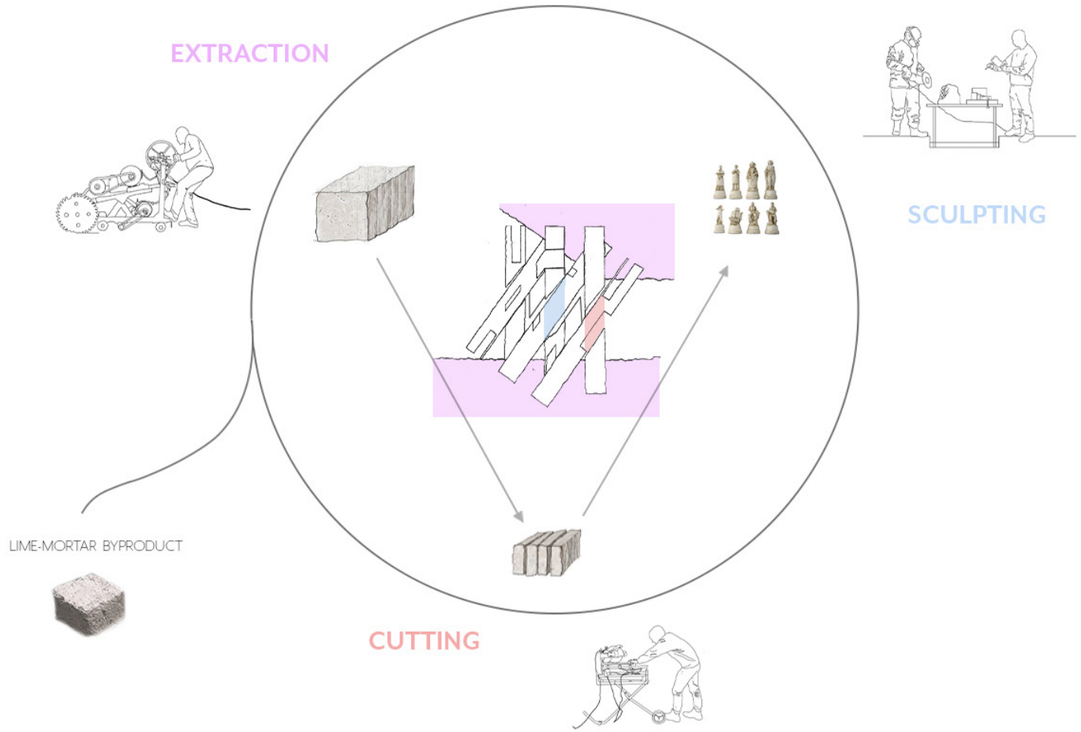






PREVIOUS ITERATIONS

The program underwent many iterations of massing and structure, balancing ideas of circulation, spatial weaving, structural integrity, and functionality. In doing this, the program acted as a pendulum swinging from concept to concept.

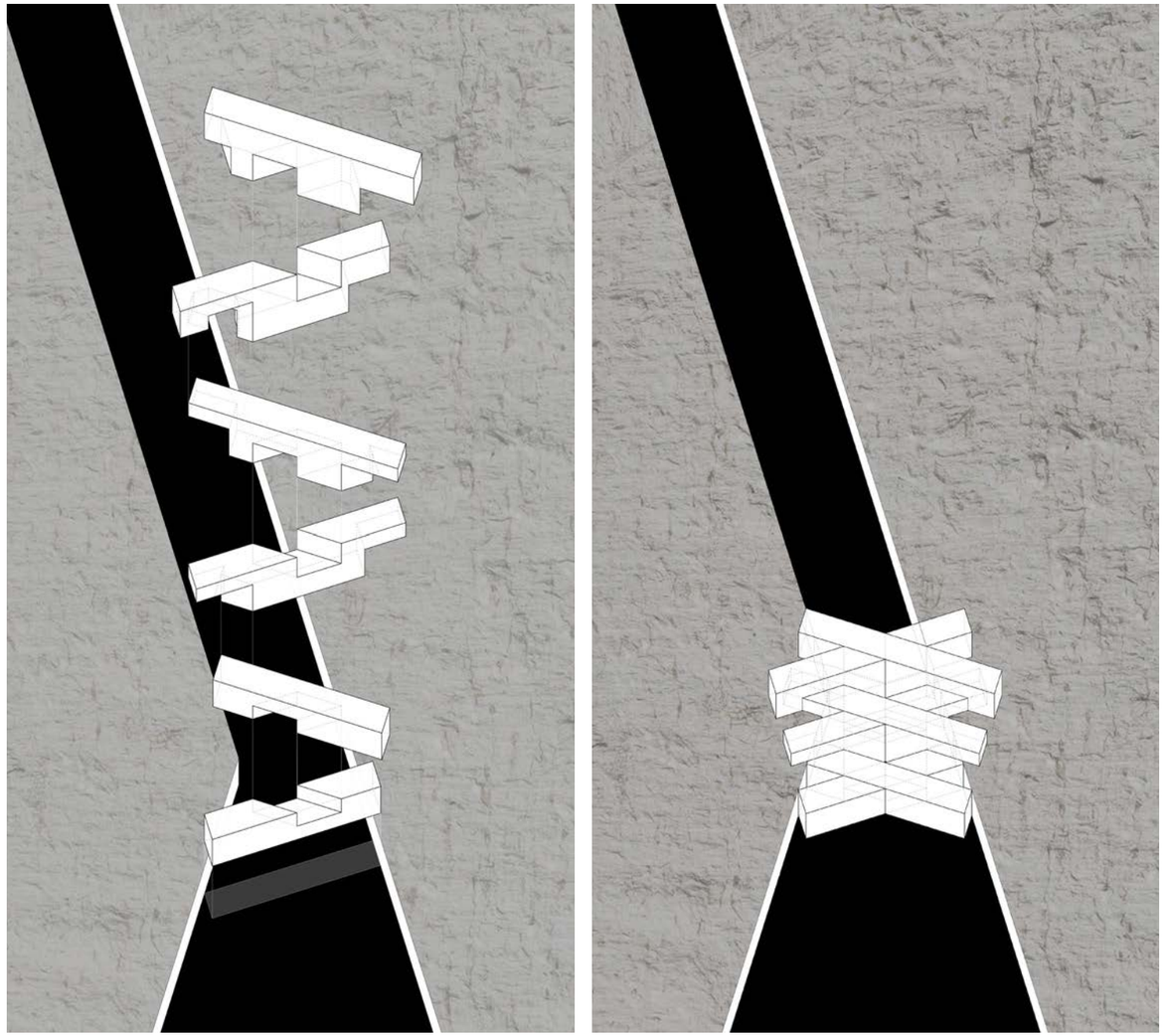


SEQUENCE D

The program works as both a spatially and physically woven system that addresses all of funtions for the stone workshop.

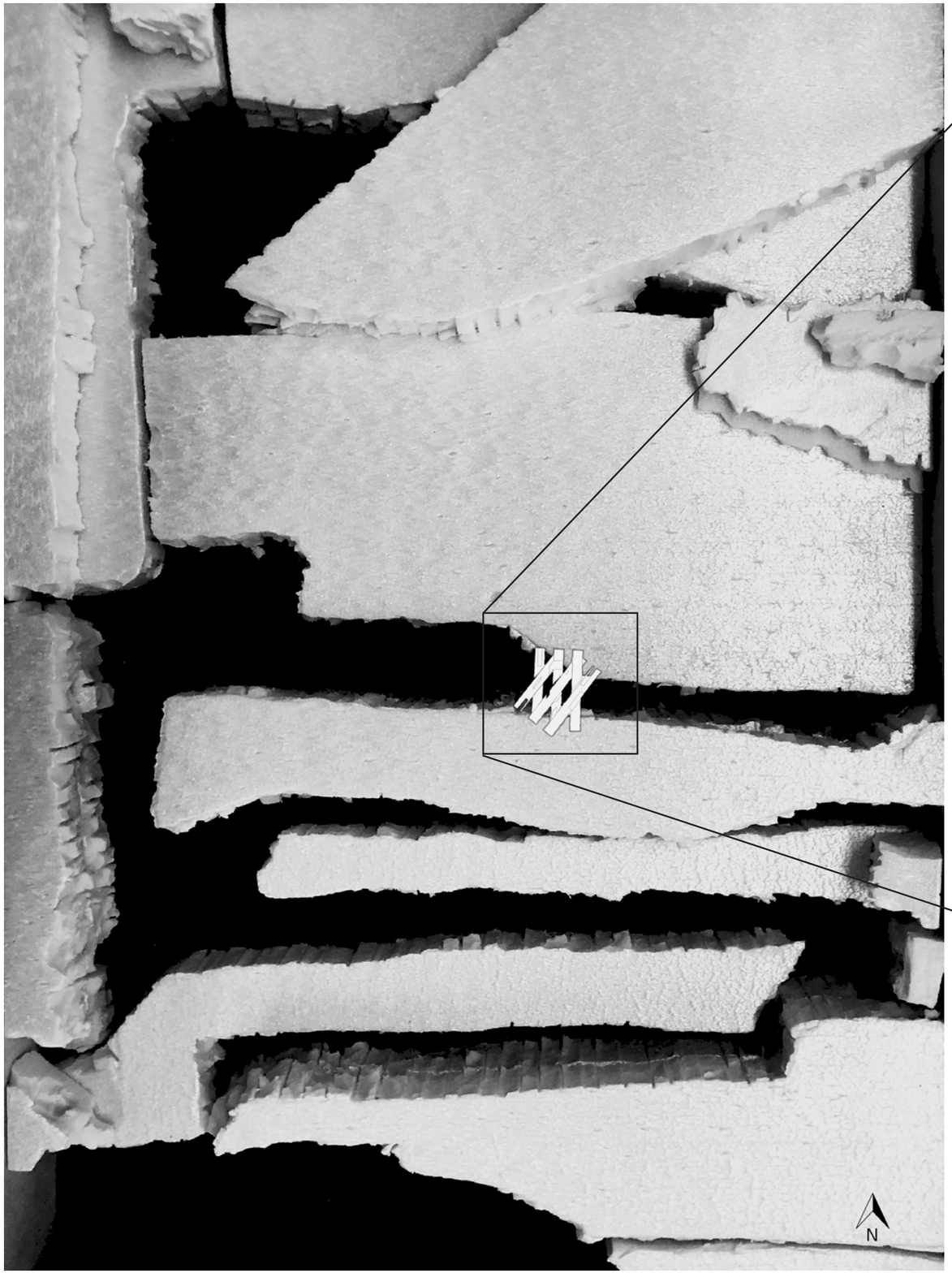
MATERIAL FLOW DIAGRAM

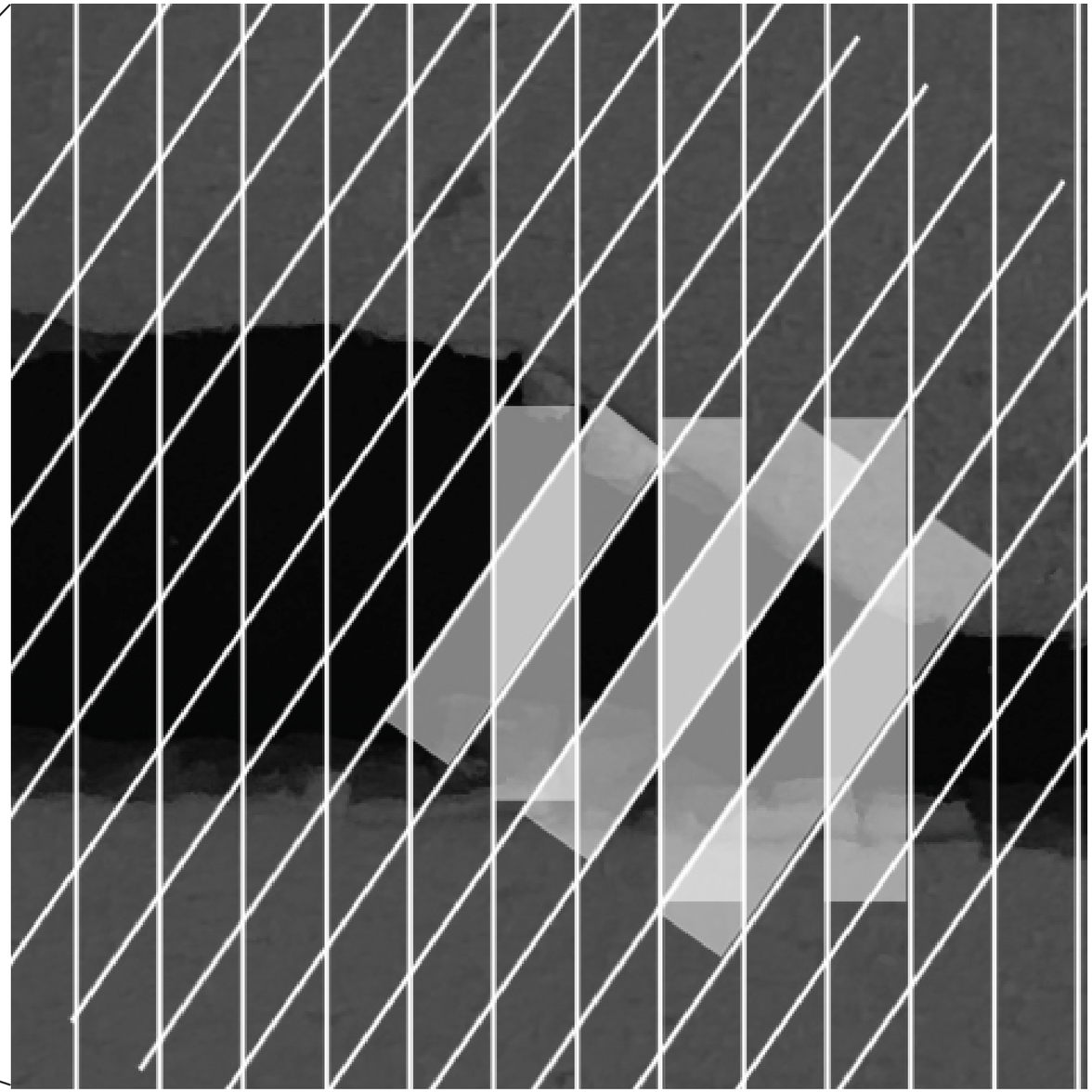
Through the process of subtraction, the artisan engages in the complete life cycle of the stones. The rock constantly changes scale through the main machining processes, where waste becomes lime-mortar, an adhesive used in the building's construction.



AXONOMETRIC MASSING DIAGRAM

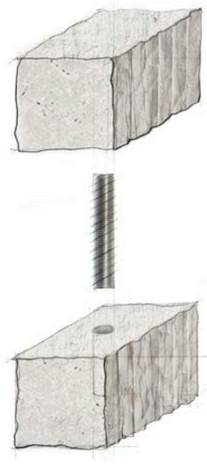
The massing utilizes the same angled lap joint originally explored. Seen on a large scale, the program weaves tightly into the gorge. With varying heights of each piece, the functional heirarchy of the building begins to establish.



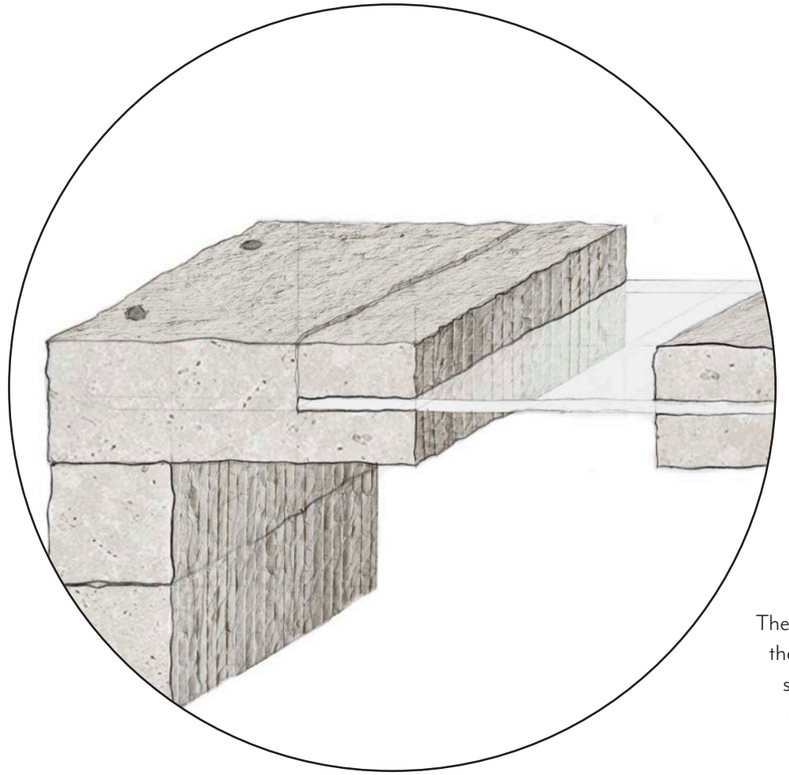


RELATION TO THE SITE

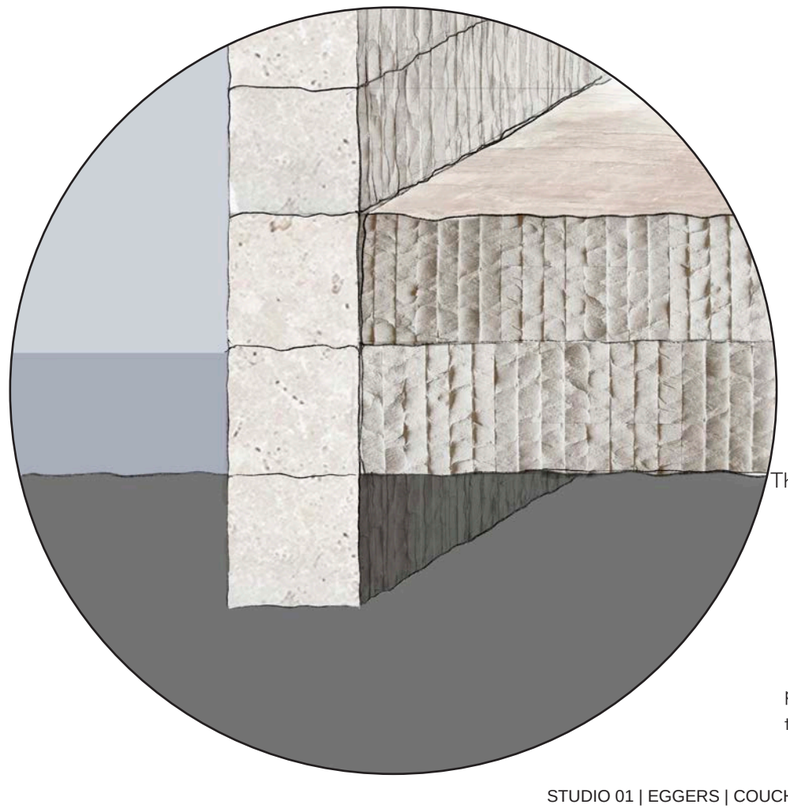
The program's massing was informed by the site; gridlines perpendicular to the angles of the cliffs established moments of intersection over the water. These intersecting zones then became the locations for the indivual functions of cutting and sculpting. Located in one of the gorges, the program has functional access to both the quarry and the water for purposes of extraction and irrigation respectively.



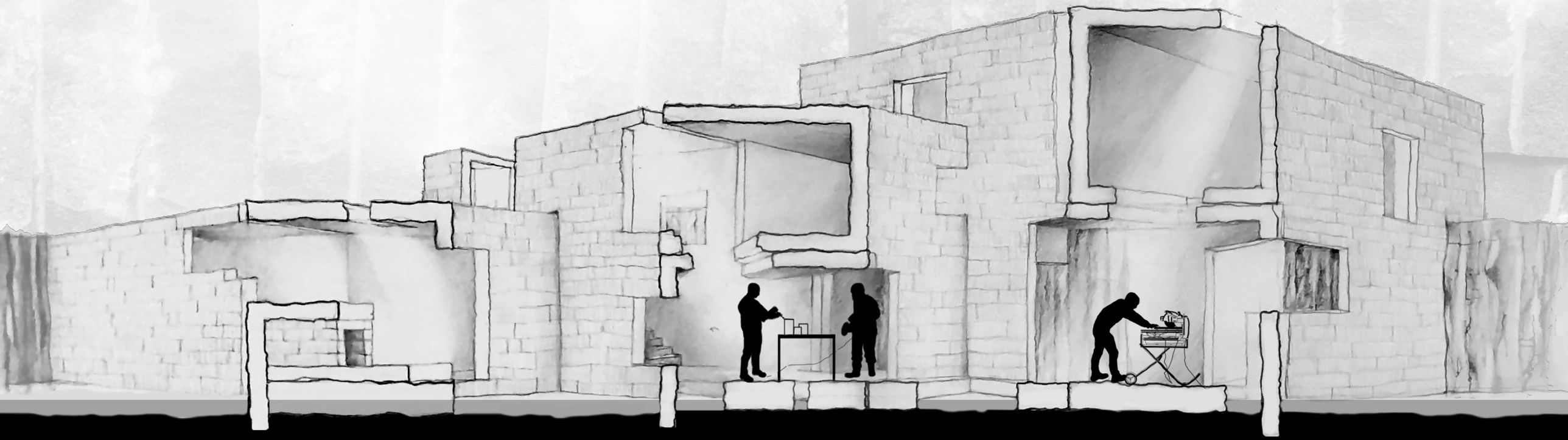
DETAILING
Long vertically striated limestone blocks stack on each other, mimicking vernacular stone masonry as well as the vertically cut cliffs in the quarry. The blocks are fastened together with a steel bolt and lime-mortar, a by product of limestone extraction.



ROOF SLAB CONNECTION
The roof slab is fixed with the steel bolts as well as structural glazing that is clamped with stone counterweights.

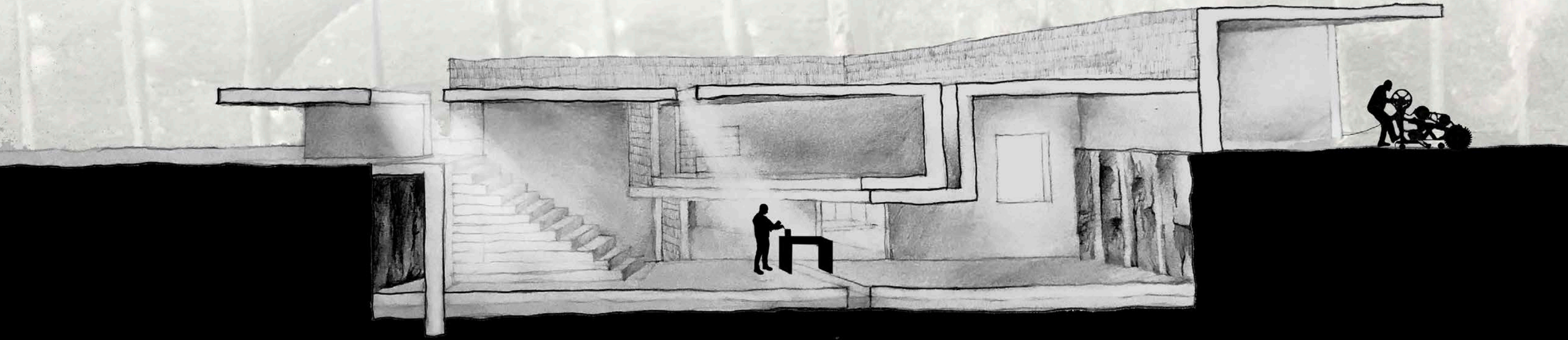


GROUND CONNECTION
The walls are anchored one foot deep into the ground, while the two-foot thick floor slab rests flat on the ground. The water level is one foot high, providing irrigation to the systems within the program.



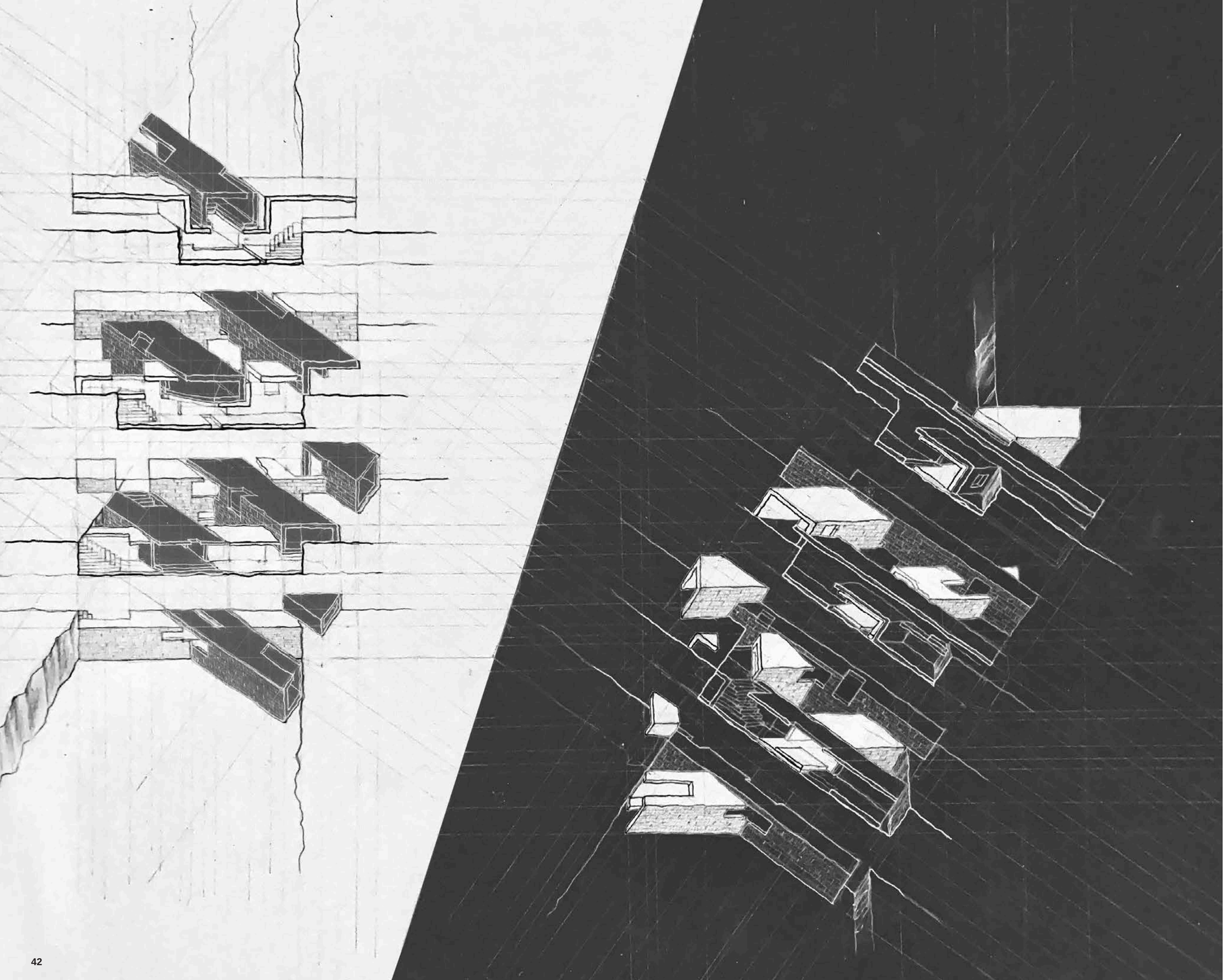
PERSPECTIVAL SECTION

At each intersection, a seperate function is located, with courtyard pathways, skylights and punctured holes connecting the spaces both functionally and spacially.



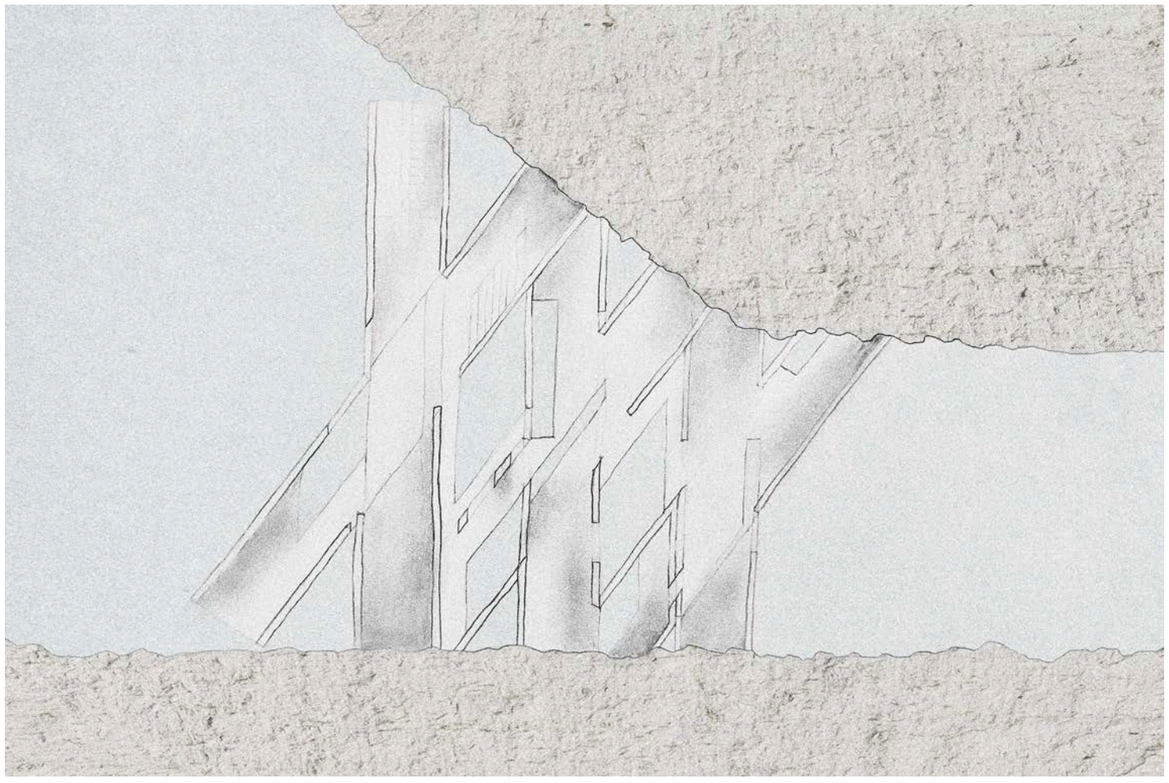
PERSPECTIVAL SECTION

Within each passage, there is a connection to the site through direct access or exposure to the material equality.



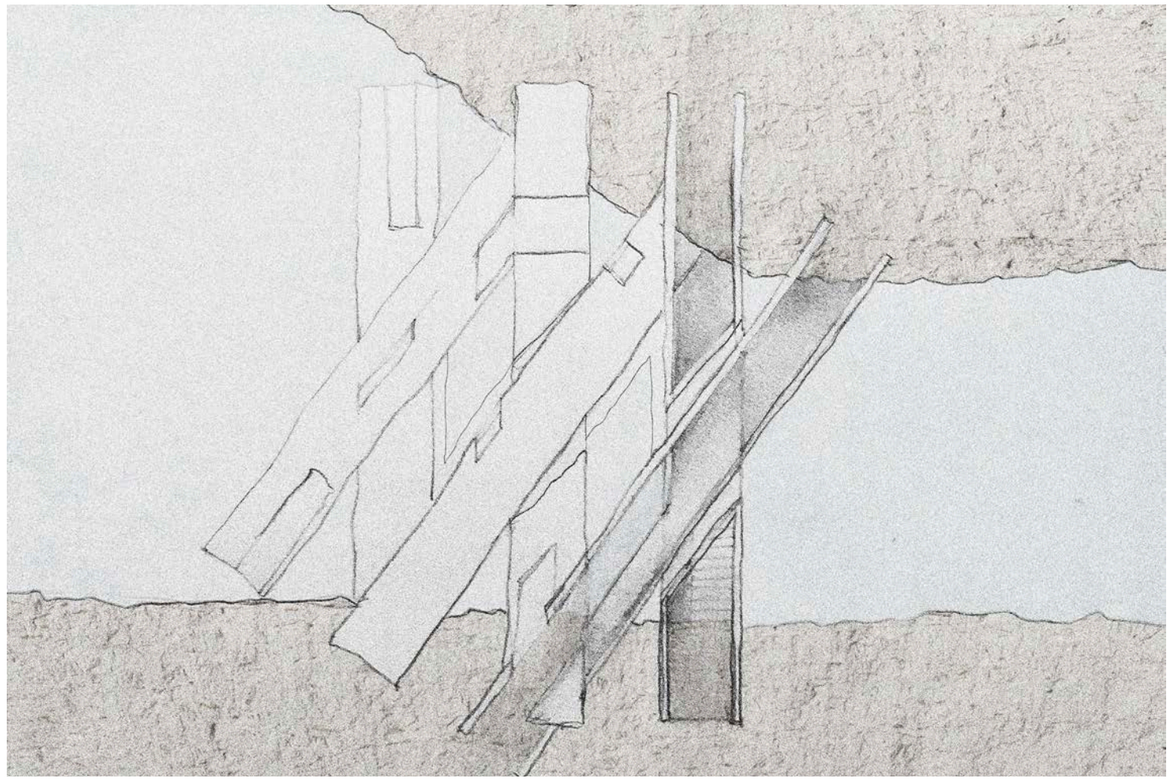
EXPLODED AXONOMETRIC SECTIONS

Each passage connects to another by moving over or under one another. To differentiate between each section I developed a logic of inverting the opposite directional paths. This mimicks the warp and weft seen in textiles.



SINGLE HEIGHT PLAN

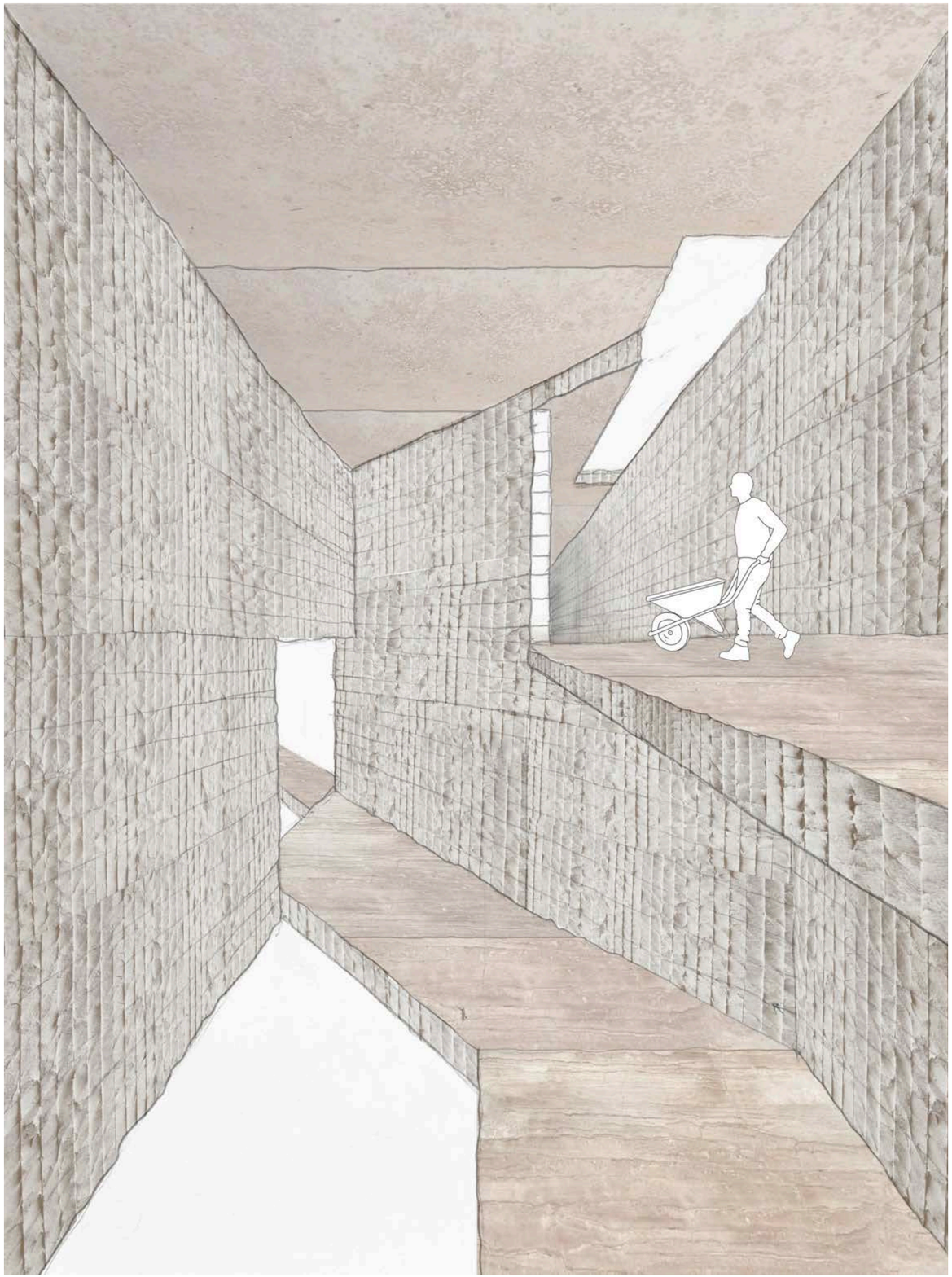
The removed holes in the ground that provide access to water for irrigation also force a woven circulation. The removed holes in the walls create ambiguity of spaces and a sense of intended direction.

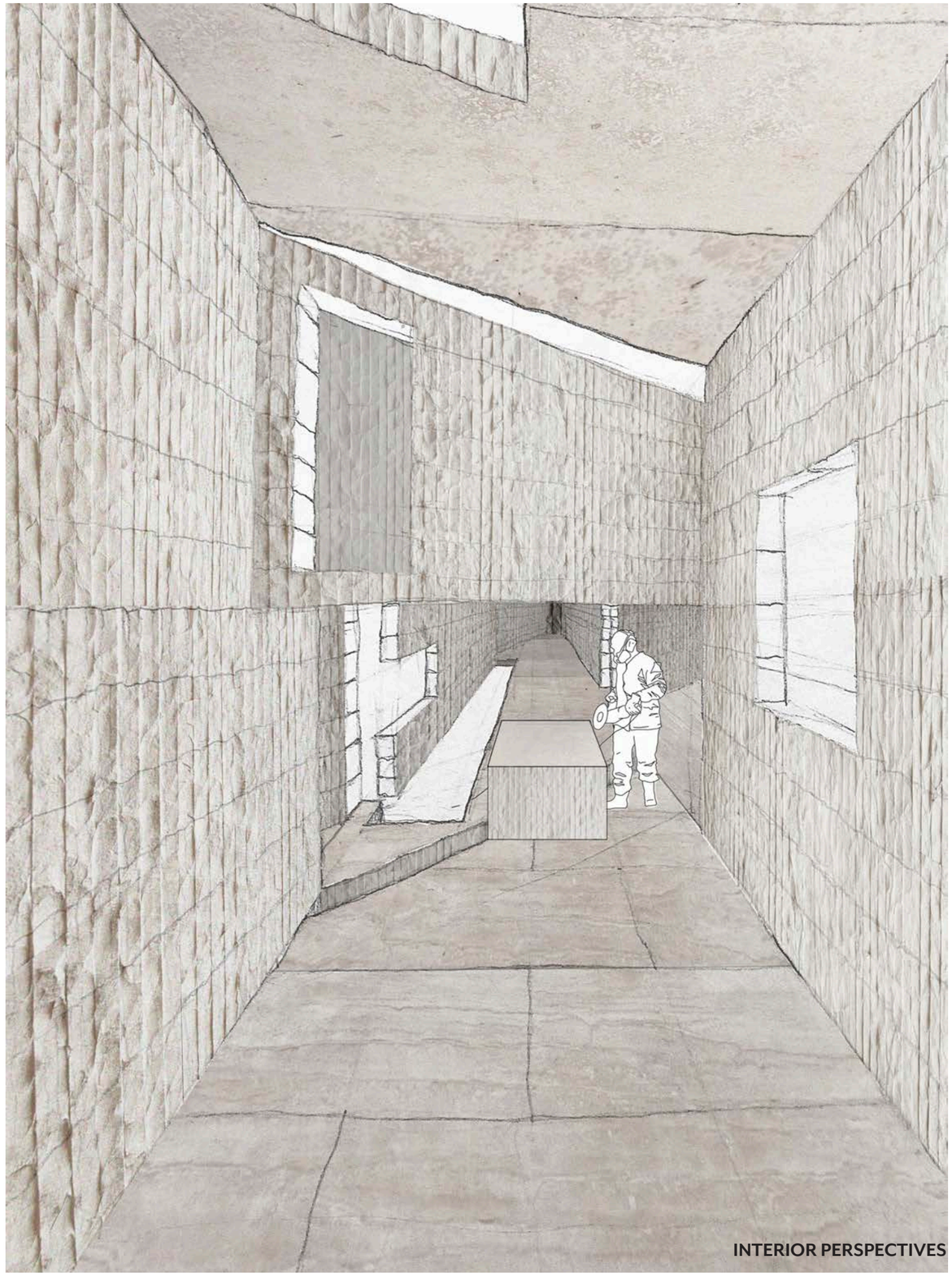


DOUBLE HEIGHT PLAN

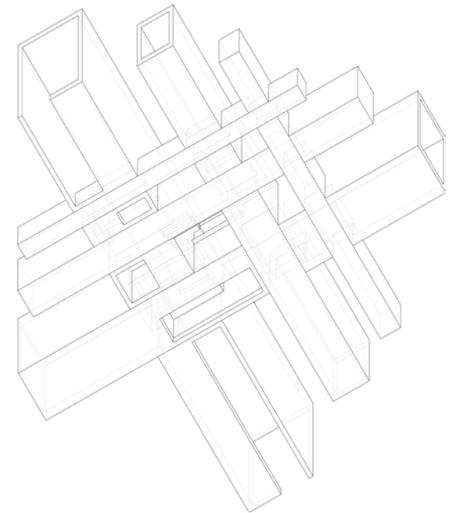
Only at double height is there direct access to the quarry. Here it is seen how the aperatures create a sense of woven light.

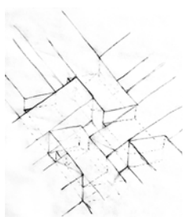
EXTERIOR PERSPECTIVE

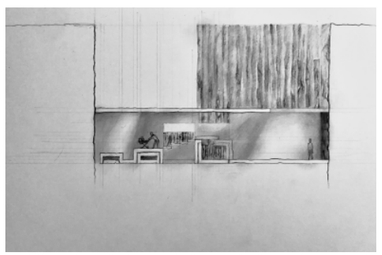


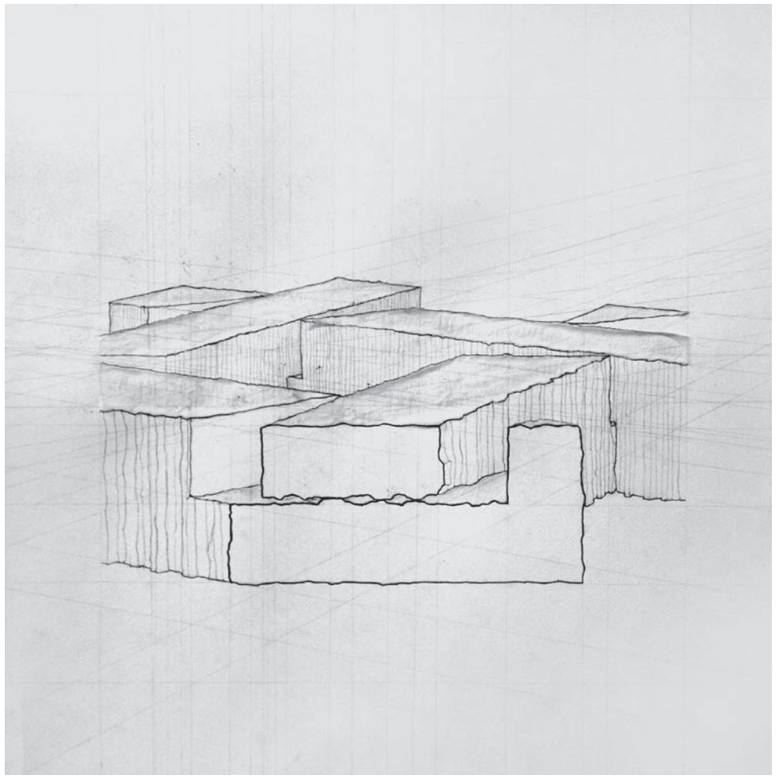


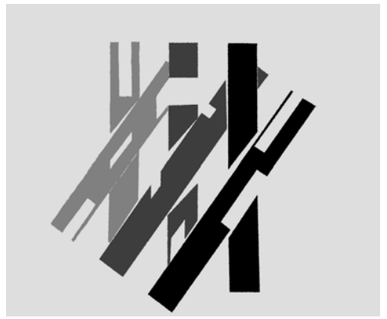
INTERIOR PERSPECTIVES

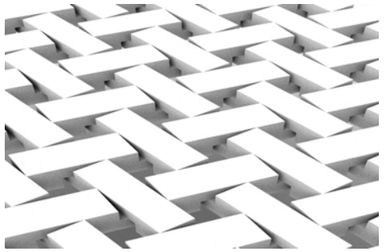


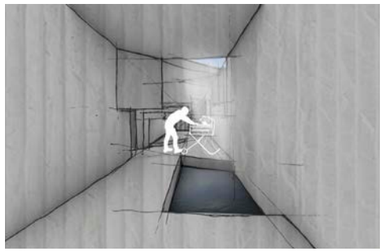


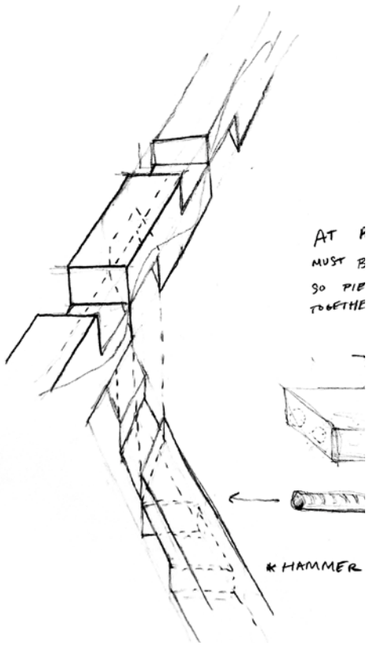








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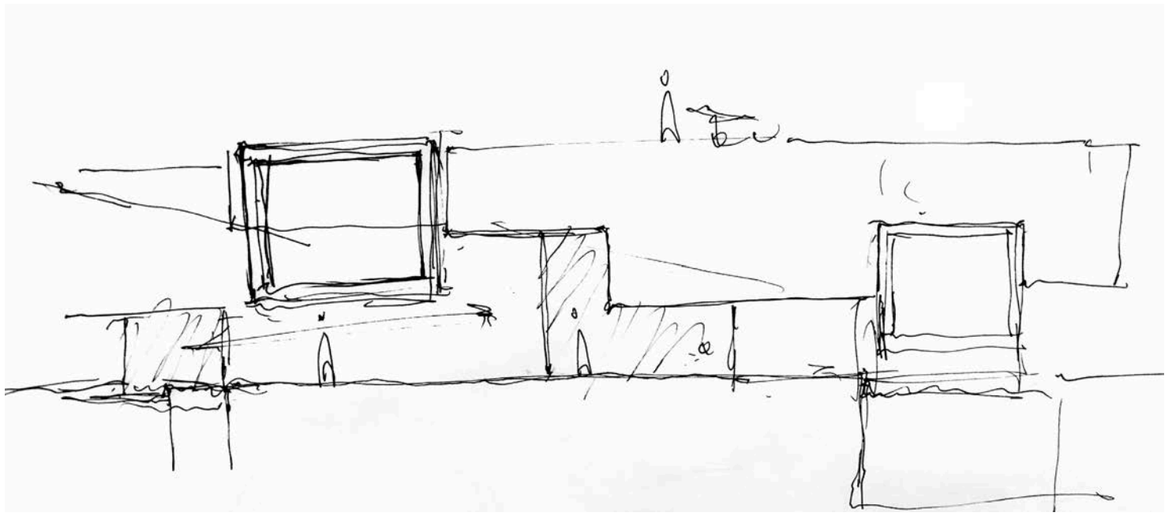

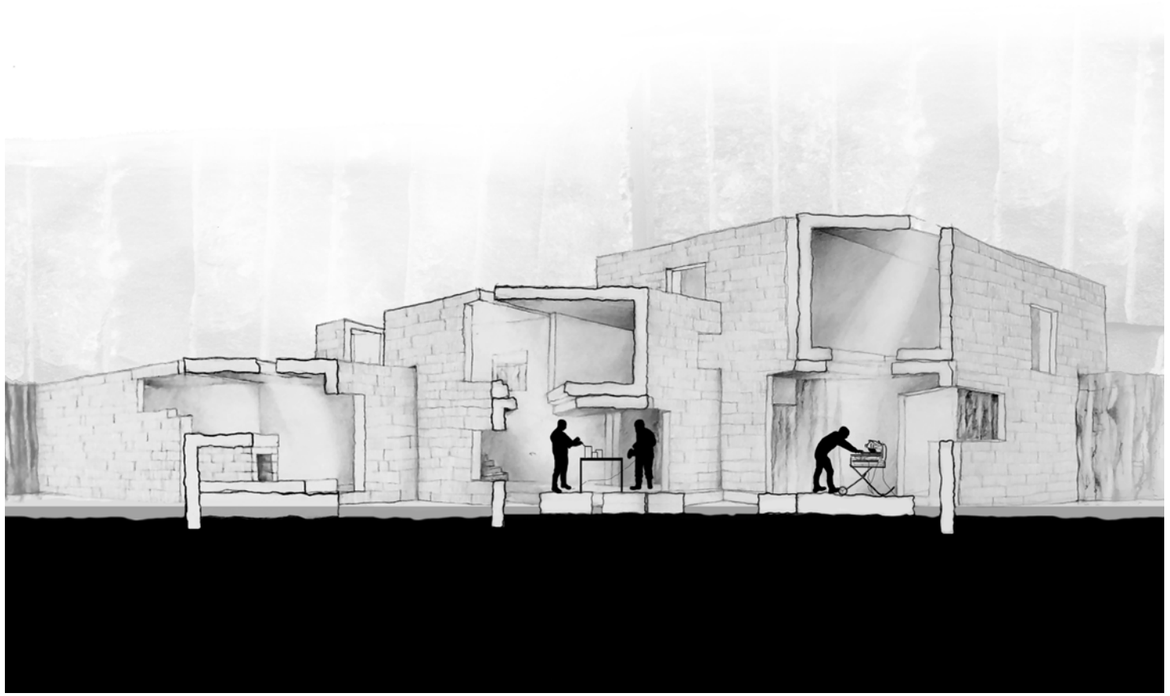

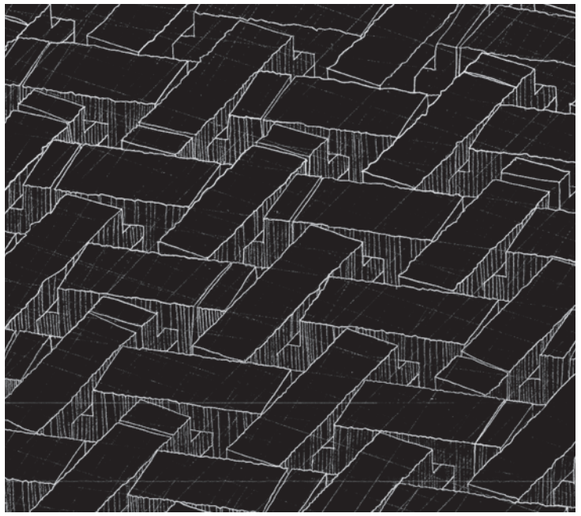

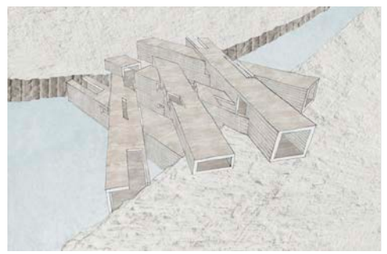

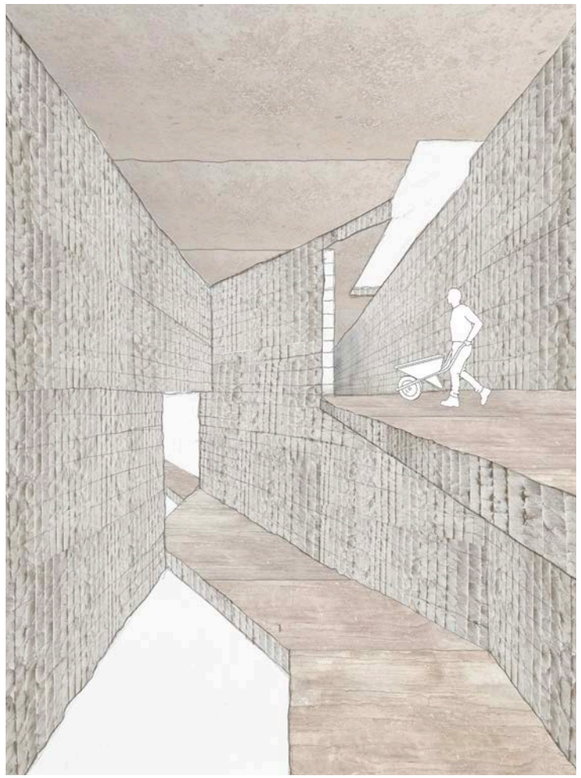

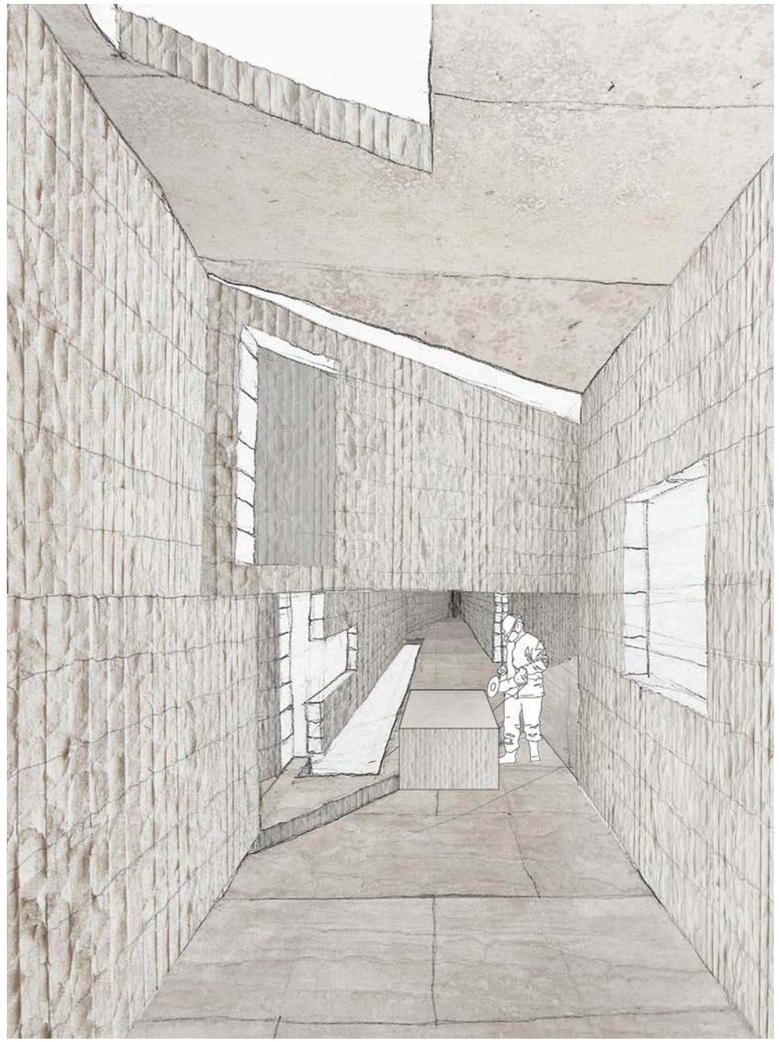

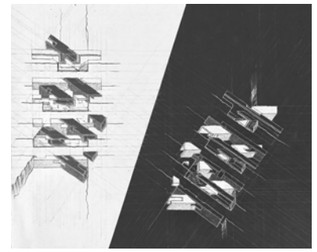

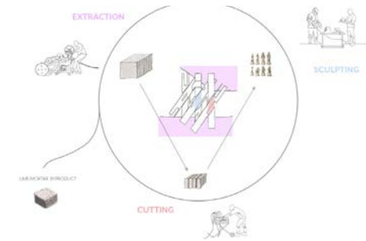
EXTRACTION
SCULPTING
CUTTING